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THE
JOURNAL OF APPLIED PSYCHOLOGY

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A NON-LANGUAGE GROUP INTELLIGENCE TEST

By RUDOLF PINTNER, Ohio State University

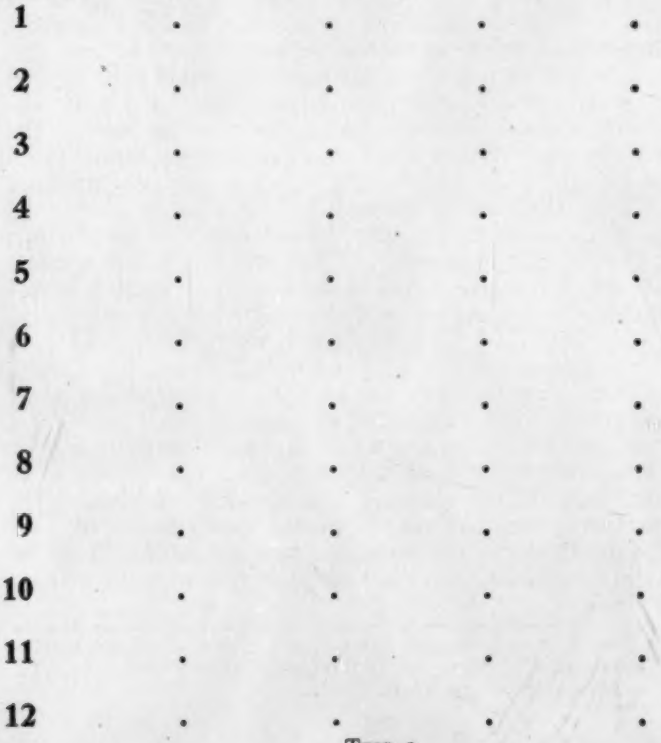
The usefulness of group tests for the measurement of intelligence is resulting in the appearance of a great number of such tests, and the development of this type of test marks the most important advance in mental testing during the past few years. The best known group tests at the present time depend largely, if not entirely, upon the knowledge and use of language. They presuppose the ability to read and write the English language. Apart from the debatable question as to whether ability to use and handle words is the best measure of general intelligence or as to whether it alone should be used as such a measure, it is very desirable to have tests which do not involve any language. In our industries and schools there are many foreigners whose knowledge of English is entirely lacking or so meagre as to be useless for testing purposes; and in addition we have a great many illiterates. The Army Beta Test and the recently published Thorndike[1] Group Test without Language are the only tests adapted for such subjects known to the writer at the present time.

For the past two years the writer has been working with a set of tests that involve no language, that can be given to illiterates, that do not demand a knowledge of English in order to understand the directions for doing the tests. In this way the illiterate, the foreigner and the deaf will all be given an equal chance with the hearing English-speaking literate individual.

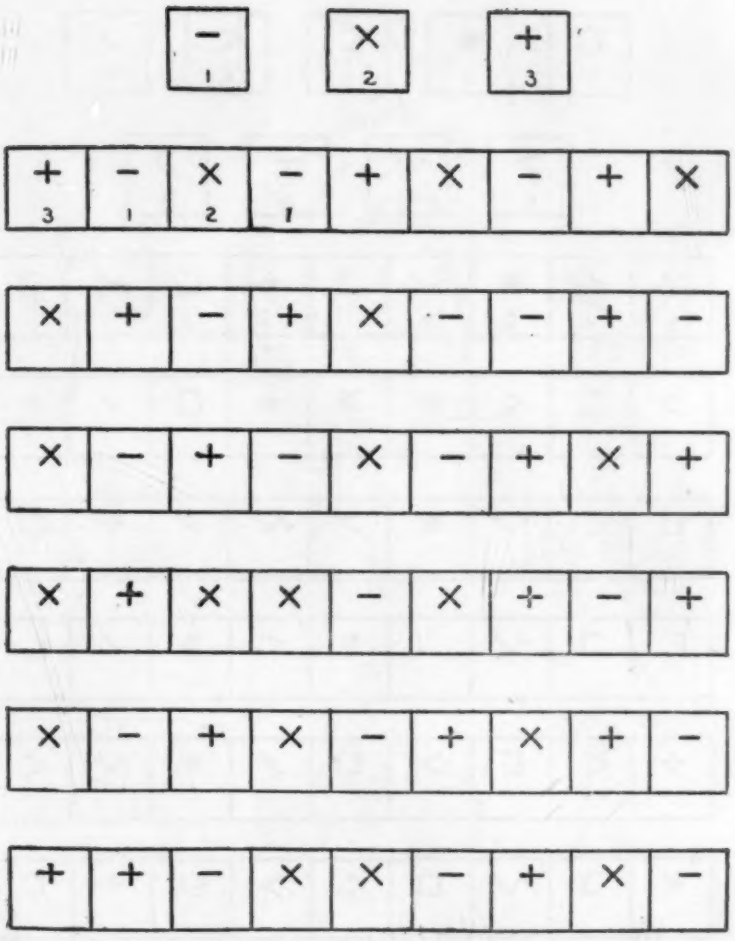
[1] Thorndike, E. L. A Standardized Group Examination of Intelligence Independent of Language. *Journal of Applied Psychology*, Vol. III, No. 1, March 1919. pp. 13-32.

Test No. 1.—The Imitation Test.

This is essentially the same as the Knox Cube Test using dots on a blackboard and a pointer to make the moves. The subjects draw lines from one dot to another showing the sequence and direction of the moves. The twelve lines in the test series were chosen out of a trial series of twenty-five and they progress gradually from easy to hard. The twenty-five lines of the trial series were chosen in such a manner that the drawing of the lines from one dot to another would be easily distinguishable on paper. In some combinations of movements from one dot to another lines coincide, and it would be impossible, when correcting the paper, to tell whether the subject had been working correctly or not. The trial series of 25 lines was given to 245 university students and also to 56 school children in the fourth and sixth grades. The following is the trial series of twenty-five lines, together with the percentages of correct responses for the children and the adults.



TEST 1



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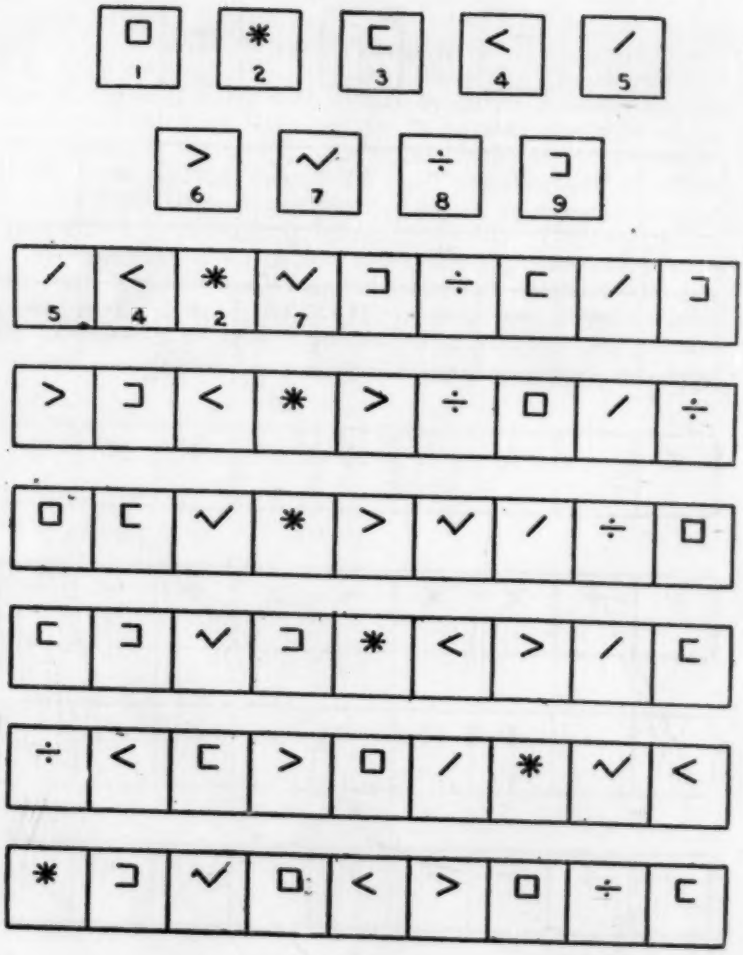
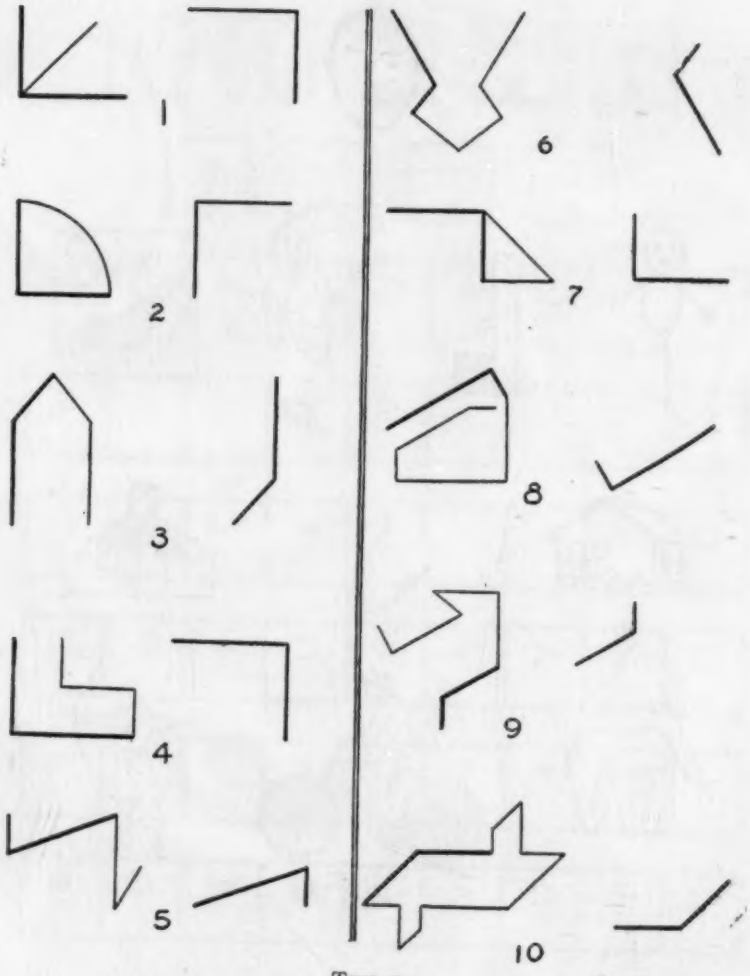
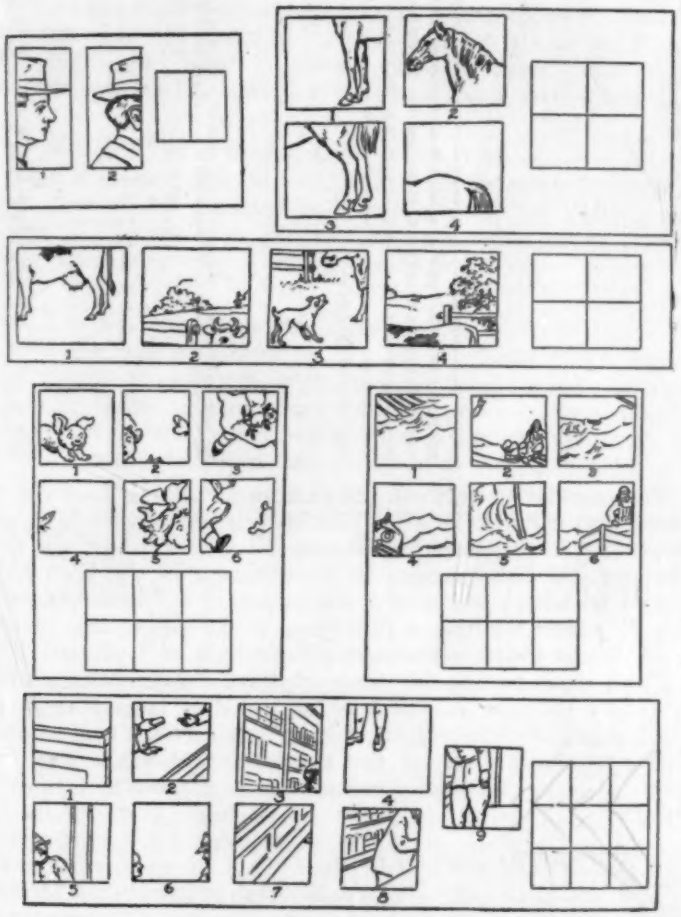


TEST 3

TEST 4



TEST 5



TEST 6

No.	Line	Per cent Correct. Adults	Children
1	1 2 3 4 2	89	86
2	1 2 3 4 1	98	97
3	1 3 4 2	88	64
4	1 2 4 3	79.5	57
5	1 3 2 4	88	61
6	1 4 2 3	93.5	52
7	1 4 3 2	96	70
8	1 2 4 3 1	65	29
9	1 3 4 2 4	57	27
10	1 4 2 3 4	81	41
11	1 3 2 4 1	74	38
12	1 2 4 3 2	68	34
13	1 3 4 2 1	71.5	41
14	1 4 3 2 1	94	66
15	1 3 2 4 2	71	23
16	1 4 2 3 1	80	20
17	1 3 2 4 3 1	62	13
18	1 2 4 3 1 4	45	14
19	1 3 4 2 1 2	54	14
20	1 4 2 3 1 2	50	7
21	1 4 3 2 1 2	78	23
22	1 2 3 4 2 1	80	50
23	1 2 3 4 3 1	90	46.5
24	1 2 4 3 2 1	77	43
25	1 2 3 4 1 4	91	59

The correlation between the rank order of the lines for the adults and children is .87. This correlation is very high and, therefore, it is somewhat immaterial which order we take. The greatest discrepancies in the difficulty of the lines occur in line 16 where we have a difference of 9.5 rank places, in line 21 where we have a difference of 5.5 places and in lines 6, 23, 1 and 4 where we have a difference of 5 places.

From these twenty-five lines we have chosen twelve which gradually increase in difficulty, basing this largely upon the adult order of difficulty but taking into account the order of difficulty obtained from the children's records. The final series of lines chosen is given under the directions for giving the tests.

Test No. 2—The Easy Learning Test.

This test is simply a very easy substitution test of the type common in psychological tests. The idea was to make a very simple substitution test which very young children could manage. For this reason only three digits were used and three very easy symbols. The squares are large enough so that small children can write in digits, and the sample digits filled in at the beginning of the test give the child an idea of what he is supposed to do.

Test No. 3.—The Hard Learning Test.

This is essentially the same as the previous test and in fact the Easy Learning Test serves as a method of teaching what is required in the Hard Learning Test. In the Hard Learning Test the child performs the same operation as in the easy test, the only difference being that here he has to work with nine digits and symbols instead of with three. The digits and symbols are those used in the standard Symbol-Digit Test.

Test No. 4.—The Drawing Completion Test.

This is a shortened form of the large Drawing Completion Test devised by Pintner and standardized by Pintner and Toops.[2] The series of pictures is arranged in order of difficulty from very easy to relatively hard.

Test No. 5.—The Reversed Drawing Test.

This test was suggested by Mr. H. A. Toops. We made a preliminary experiment with a large number of drawings and tried these out on a great many observers before choosing the ten for the final series. The final series was again arrived at by choosing drawings that progress in difficulty from easy to hard. In each case the figure to be completed is started by two lines so that whether the reversal is up-down or right-left the observer must himself decide by finishing the picture from the two lines that are given. It is obviously a type of spatial relations test.

Test No. 6.—The Picture Reconstruction Test.

This test was devised by the writer, the idea being to give as a group test the common operation of putting blocks together that will form a complete picture. It is essentially the same as the child's game of putting pieces together to form a picture. However, when we transfer this to paper and do not allow the manipulation of the parts of the picture, it becomes very much more difficult. It means that we have to reconstruct more or less in our minds the complete picture. Several pictures were arranged and mimeographed copies of these were made from which six were chosen. These six progress from very simple to very hard pictures.

The whole series of six tests are made up in booklet form allowing one page for each test and the first cover page for name, age, school, etc.

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[2] Pintner, R. and Toops, H. A. A Drawing Completion Test. *Journal of Applied Psychology*, Vol. II, No. 2, June 1918. pp.164-173.

Time Limits.

After the final series for each test was decided upon, it was necessary to fix upon a time limit for each test. For this purpose the tests were tried out on adults and children in order to get some idea of adequate time limits. As a general rule a time limit for any test should be such that none, or at least very few, should be able to finish within the time limit. Since these tests are to be given to all ages from six or seven upwards it is, of course, impossible to adhere to this standard rigidly, because, if we did so, we should have to fix the time limit in accordance with what the quickest adult could perform. In many cases this would mean that the seven-year-old child would hardly have time to begin the test before the time limit would have elapsed. We must, therefore, adjust our limit rather to the medium aged child.

Furthermore, we can draw a distinction between some tests where the time is very essential and others where rapidity of work is not so essential. Rapidity of work is the greatest factor in tests two and three, but is not nearly so important in the other tests.

A group of children were tested and the time for the first who finished was taken. This gives us the following times:

Test 2—47 sec.
Test 3—73 sec.
Test 4—1 min.
Test 5—2.5 mins.
Test 6—5 mins. (but not correct).

For Test 2 it took 1 minute 20 seconds for about half the class to finish, for Test 3, 1 minute 45 seconds for half the class, and Test 4, 1 minute 45 seconds. In Tests 5 and 6 the children were stopped after 6 minutes because practically none of them had finished and these are tests over which children may ponder for a long time.

Using this data and other results from adult observers as a basis the time limits, as given below under the directions for giving the tests, were decided upon, making a total of 13.5 minutes in addition to the time required for giving Test 1.

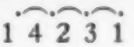
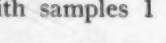
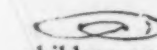
With reference to these time limits we may note that one minute for Test 2 is rather too long for older children, but since this test is an important one for younger children it is necessary to give them adequate time to get under way. It takes an adult working rapidly about 37 seconds to finish, but only 50 to 60% of University students finish within one minute. For Test 3, 1½ minutes will permit very few chil-

dren to finish. In Test 4, 2 minutes as a rule is ample, and this length of time is allowed because rapidity of work is not the essential factor in this test. The time limits of 4 and 5 minutes for Tests 5 and 6 respectively are very liberal for the older children and this has been purposely so arranged, because in these two tests quality of work rather than speed is the essential factor. With the younger children these time limits have been found to be fully adequate for all that they are able to accomplish.

Directions for Giving the Tests.

Pass papers—have subjects put full name, age last birthday and grade on first page and tell them not to turn page until told to do so.

Test 1.—Imitation.

No time limit. Draw on blackboard one row of four large dots and also to one side of the board three rows of smaller dots in rows as on sheet. Move the pointer from dot to dot in order 1 2 3 4 and, using the first series of smaller dots, draw lines to show subject what he is to do, thus 
Follow with samples 1 2 3 4 2  , 1 4 2 3 1  . There is no need to do any talking if the children are foreign or deaf. After giving the samples have the subjects take their pencils. Erase the three samples on the board.

Give the following series in order with sufficient intervals for the subjects to draw the connecting lines.

1.....	1 2 3 4 1	7.....	1 3 2 4 1
2.....	1 4 3 2	8.....	1 2 3 4 2 1
3.....	1 4 2 3	9.....	1 3 2 4 2
4.....	1 4 3 2 1	10.....	1 2 4 3 1
5.....	1 2 3 4 3 1	11.....	1 3 4 2 1 2
6.....	1 3 4 2	12.....	1 2 4 3 1 4

Before beginning each row be sure to have the attention of the group and at the end give some signal to them to draw the line on their paper. Move the pointer from one dot to the other without raising it from the blackboard at the rate of about one a second pausing somewhat on each dot.

Test 2.—Easy Learning. Time limit 1 minute.

Hold sheet up before the class and point to the key at the top, first at the symbol, then to the numbers, explaining that they must copy in the numbers. Also show the children that

the first few squares have been filled in and indicate that they are to complete the sheet.

With young children draw a sample on the board.

Test 3.—Hard Learning. Time limit 1½ minutes.

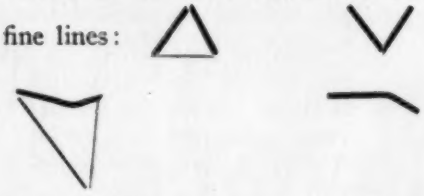
Proceed as in Test 2.

Test 4.—Drawing Completion. Time limit 2 minutes.

Draw a head without one eye on the board. Ask what is missing. Draw in the eye. Hold the test blank up before the class and pretend to draw the eye, and indicate they are also to complete the other drawings.

Test 5.—Reversed Drawings. Time limit 4 minutes.

Draw on the board the two following samples, accentuating the heavy and fine lines:



Trace with the finger the heavy lines on the first figure and then the similar lines on the second figure. Cover the first figure with the opened left hand palm towards the board, turn the hand slowly over, at the same time bringing it to cover the second figure, showing by the motion that the figure has been reversed. Repeat this movement once or twice. Now trace the fine line on the first figure with the finger and show where it should go on the second figure. Then draw in the fine line and repeat once again the turning-over movement of the hand. In the same way demonstrate the third and fourth figures composing the second sample. If the children are hearing English-speaking appropriate language should accompany the demonstration, without however adding to the instructions.

Test 6.—Picture Reconstruction. Time limit 5 minutes.

For this test a sample picture cut in half and mounted on cardboard with the numbers 2 and 1 on the two halves of the picture must be prepared. The writer uses a drawing of a little girl traced in India ink on two pieces of white cardboard each measuring about 6 x 17 inches. The number 2 must be at the bottom of the left half of the picture (facing the picture) and the number 1 on the right half. Place the two pieces in order 1 2 on the rail of the blackboard, i. e., the two

parts of the picture will not be in the right order. On the board draw a square divided into two parts for the numbers as on the test blank. Trace with finger the outline of the first part of the picture and indicate into which space it would go on the board and similarly with the second part of the picture. Then point to number 2 and write it in the first space on the board and then to number 1 and write it in the other. Pointing to the numbers and spaces may be repeated more than once. Having written in the numbers now hold the two parts of the picture over the space on the board so as to make a complete picture and indicate the complete picture. Then show that the numbers in the spaces on the board correspond with the numbers at the bottom of the two parts of the picture which is now being held just above them. This demonstration is generally sufficient to prepare the children for the test, beginning as it does with a very simple example almost the same as the sample used in the demonstration.

Scoring the Tests.

Celluloid stencils are used in scoring Tests 1, 2, 3, 5 and 6, thus simplifying the work and making it very rapid. A stencil does not help in scoring Test 4 (Drawing Completion). The following crude scores are given:

Test 1—One point for each line absolutely correct. Total, 12 points.

Test 2—One point for each space filled in with the correct digit. Total, 50 points.

Test 3—One point for each space filled in with the correct digit. Total, 50 points.

Test 4—Two points for the right thing in the right place; one point for the right thing but not rightly placed. Total, 20 points.

Test 5—One point for each reversed drawing correctly performed. Total, 10 points.

Test 6—One point for each number in the proper space. Total, 31 points.

Having scored the test these crude scores are recorded on a record card and weighted as follows:

Test	Maximum Crude Score	Weight	Maximum Weighted Score
1	12	9	108
2	50	2	100
3	50	2	100
4	20	5	100
5	10	10	100
6	31	3	93
Total			601

Correlations.

The following correlations have been obtained between each test and the total score on the whole series of tests:

	Test					
Age	n.	1.	2.	3.	4.	5.	6.
9.....	127	78	83	84	76	67	65
12.....	110	67	78	80	50	50	56
University Students.....	74	36	44	45	41	66	66

Tests 2 and 3 give the highest correlations for the children, while Tests 5 and 6 give the highest correlations for the adults.

Standards.

Tentative standard scores based upon results with ordinary grade children according to age are shown in Table I, which gives the number of cases tested at each age, the median and the 80 and 20 percentiles. It will be seen that the median

Table I. Distribution of Scores by Ages

Age	7	8	9	10	11	12	13	Univ. Students
No.....	72	97	143	195	175	127	111	72
80 Percentile	123	231	301	338	352	357	382	549
Median.....	76	130	190	272	285	290	309	501
20 Percentile	38	72	111	170	202	202	209	419

score rises steadily at each age, and the same is true of the 80 and 20 percentile scores.

Table II gives a percentage distribution of the cases arranged according to age and to score, showing a steady in-

Table II. Percentage Distribution According to Age and Score

	Age								
Score	7	8	9	10	11	12	13	14	Univ. Students
0— 99....	67	33	18	12	4	2	5	..	..
100—199....	28	37	34	13	15	16	14	16	..
200—299....	5	25	26	38	37	34	27	33	..
300—399....	..	5	21	32	36	40	42	38	15
400—499....	..	..	1	5	6	7	12	13	34
500—601....	..	..	..	2	1	..	..	..	51

crease in score from age to age and a fairly wide distribution of abilities at each age, such as we would expect among unselected school children.

Figure I shows a percentage distribution curve for ages 7, 9, 11, 13 and University Students. We note how the curves shift over from the left to the right with the advance in age.

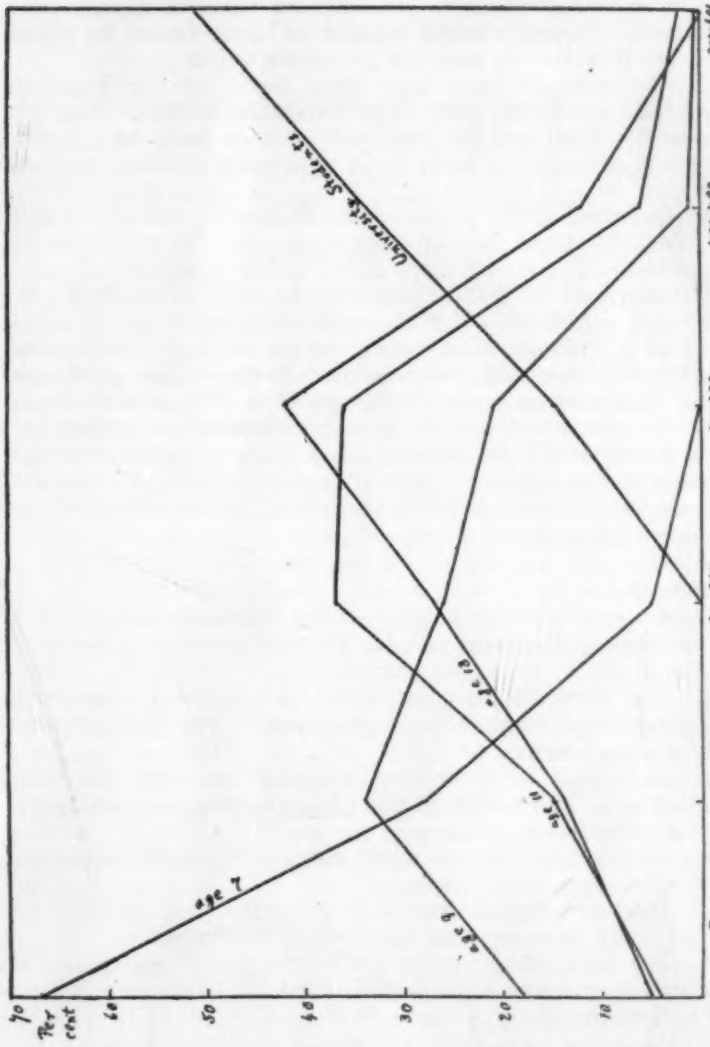


FIG. I. PERCENTAGE DISTRIBUTION. BY AGES.

None of the seven-year-olds make scores above 299 and none of the University students make scores below 300. Although the modes of the curves at each age are distinct and increase in score, there is considerable overlapping in abilities at each age as there should be.

The results given here can only be regarded as tentative standards. A much larger number of cases should be tested in order to arrive at accurate percentile norms.

So far only 16 cases have been tested on the Stanford Binet and this group test. The correlation between the I. Q. on the Stanford and the percentile rank on these tests is .66. There is obviously a fairly close agreement between the two ratings.

With regard to the scores of the University students it will be noted that about half of them score over 500 points out of a possible 601, but that there also is a fair scattering of cases down to scores of 300. None obtained the maximum score, so that it would seem that the test is capable of giving some kind of a differentiation among people of high intelligence. A group of nine university instructors were also given the test. The median score of this group is 573, as contrasted with the median of 501 for university students. Indeed all, except one, of the instructors made a score higher than the median of the students. It would seem, therefore, that the test might show some differentiation of ability among those making high scores.

Summary.

1. A set of six non-language tests has been arranged for group testing purposes, suitable for school children and for adults.
2. The tests can be given alike to English-speaking and non-English-speaking subjects, to literates and illiterates, to deaf and to hearing.
3. A method of procedure in giving the tests has been worked out. The time required for explaining and giving the tests is about thirty minutes.
4. Correlations between each test and the total score are all positive and fairly high.
5. Tentative norms have been arrived at for children of ages 7 to 13 inclusive, and for University students.
6. The tests should prove useful in mental survey work particularly in communities where there is a large foreign or illiterate element.

A GROUP INTELLIGENCE SCALE FOR PRIMARY GRADES

By Frances Lowell, University of Minnesota

Introduction

In October, 1917, the writer began a survey of all the schools in one of the representative counties in Minnesota, for the purpose of locating all cases of subnormality.[1] Such a survey necessitates, among other things, visiting every school in the county, selecting all children of questionable mentality, and testing them, individually, with the Binet-Simon tests.

The selection of retarded and subnormal children above the third grade is relatively easy, for teachers' estimates, previous school records, and repetition of grades without the excuse of a long continued absence taken together form a fairly accurate basis. However, such methods are practically impossible in and below the third grade. This is due to several factors: first, to the inaccuracy of the school records for primary grades; second, to the frequent change of teachers, especially in the rural schools; third, to the fact that many children have been in school too short a time to become sufficiently retarded pedagogically to suggest a diagnosis of mental deficiency; and fourth, to the inability of many children, on entering school, to do themselves justice in the grade because of the strangeness of the new environment. Other difficulties, common to all grades, are also encountered in such a survey. Teachers frequently persuade themselves that since a child is sweet, docile and attractive, he must necessarily be bright; or, because he is doing good work in his grade, he is undoubtedly normal, regardless of the fact that he is two or three years older than his classmates. In one rural school, the teacher, on being asked about the work of twin girls in the third grade, said with great assurance, "Oh, those girls are very bright. They do good third grade work, and they are such nice children." The twins in question had a chronological age of twelve years, a fact entirely overlooked by the teacher in her estimation of their ability. Mentally, they were found to be

[1] This survey was made under the direction of Dr. Fred Kuhlmann, Director of Research, Faribault, Minnesota.

7⅝ and 8⅜ years, respectively, when given the Binet tests. Hence, in order to have an accurate survey, the need for an impersonal method of selecting children of doubtful mentality was imperative.

History of Group Tests

At the time the survey was undertaken, no group scales of intelligence had been published. Many single group tests had been standardized and published, but these, alone, are insufficient for making even a rough classification of children. However, within the past year, two scales have appeared, namely, one given in the "Mental Survey"[2] and "A Group Point Scale."[3] The group tests used in army work are not discussed here because they are intended for adults only, and, too, because they have not been published.

Pintner, in his "Mental Survey," recognizes the need for standardized survey tests for selecting individuals for further examination and for special promotions in the schools. To provide such a scale, he uses well known tests, namely:

1) Rote memory
2) Digit-symbol
3) Symbol-digit
4) Word-building
5) Opposites
6) Cancellation.

Norms, in terms of percentiles for each chronological age from six to sixteen inclusive, are given for each of the six tests. Each individual's record of actual attainment is taken for each test, and later translated into its corresponding percentile. The index of a child's mentality is found by getting the median of the six percentiles.

The reliability of the survey scale is checked by correlating results with those found by using the Yerkes Point Scale. In the sixth grade a correlation of only .29 was found; in the fourth grade a correlation of .59 existed, and in the second grade, one of .71. When compared with results from Binet tests, the correlation was found to be .66. These results tend to show, according to Pintner, "that we must not place too much reliability on the survey tests for individual purposes, but that for groups they give a fairly accurate measure of mentality."

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[2] R. Pintner: *The Mental Survey.* 1918.

[3] S. L. Pressey and L. W. Pressey: A Group Point Scale. *Journal of Applied Psychology.* September, 1918.

The Presseys took charge of the mental testing done in connection with the survey of a certain county in Indiana, which the Departments of Psychology and Sociology of Indiana University started in the fall of 1917. They, too, felt the need for group tests where large numbers of children were to be tested and so they tried to work out "a scale composed of tests which should be applicable over a wide range of ages —if possible from the second grade through high school— and which should be highly differential of general intelligence throughout this range."

The first requirement, in the selection of any test, is that its "beginning be easy enough and the directions clear enough so that nine-tenths of the 3B children would make some score, and that the end of the test should be hard enough so that no one of the high school scphomores (averaging sixteen years old) would make a perfect score."

The second requirement for the tests, and the one which the Presseys consider the most original feature of their scale, is that of "careful adaptation in the nature of the tests, and in flexibility and ease in control of the class, for work with school children."

The tests used are:

1) Rote memory
2) Logical selection
3) Arithmetic
4) Opposites
5) Logical memory
6) Word completion
7) Moral classification
8) Dissected sentences
9) Practical information
10) Analogies.

The results of these tests have been worked out in terms of percentiles, and norms published for about one thousand children. Then the reliability of the tests in sorting out extreme cases was checked up by comparing group records of twenty-one children found in the public schools—who, according to the Binet tests, had I. Q.'s of .76 or below—with records of normal children. It was found that the twenty-one cases "average at the 4 percentile of their age by the group tests; the highest scores made by these cases were at the 8 percentile."

The ability of the tests to sort out extreme cases was further noted in testing a group of "gifted" children with I. Q.'s above 1.25, and also a group of children from an institution

for feebleminded. The former group made scores averaging at the 98 percentile, whereas, in the latter group, only three were able to make a rating above the lowest 10 percentile of school children of the same ages.

Again, the age-grade status of children was compared with their rating by the group scale, and "the 143 retards in the ages from ten through sixteen average 70 points lower on their group test score than the 124 accelerates of the same ages."

The correlation of group test rank with teachers' rank, averages .65.

Finally, in order to show the reliability of the tests as a measure of general intelligence, comparisons have been made between results from three cities for one age and also for one grade. "The results obtained by the group tests by age show an average difference for the medians of less than two points, whereas the differences by grade average thirteen points." In other words, if a comparison of results from a single age group, as eight, is made for each of three cities, there will be an average difference for the medians of less than two points. However, if one compares the results from one grade, such as the third, for each of the three cities, the difference for the medians will average thirteen points.

Although both the Pressey and Pintner scales seem to furnish a fairly reliable method for sorting and classifying large groups of children above the second grade, neither of them can be applied in the kindergarten or first grade, because children just entering school can neither read nor write, and both of these accomplishments are necessary to success in the Pintner and Pressey scales. Therefore, even had these tests been available in the fall of 1917, they would not have been entirely satisfactory for the purposes of the writer.

Purposes of the Present Scale

In devising and standardizing the present group tests, the writer had two purposes in mind: first, to secure a scale for measuring the intelligence of large groups of children accurately enough to sort out all children of questionable normality. One could then be reasonably certain that these children, when tested individually by the Binet revisions, would be found mentally deficient, and the time ordinarily spent in testing cases wrongly estimated by teachers to be subnormal, would be saved.

The second purpose was to obtain a group scale which would discriminate between dull, average and super-normal

children in kindergarten and primary grades. One finds here children who, regardless of their chronological age, are mentally capable of attempting the school work of the next higher class. On the contrary, some children will succeed better if permitted to remain a second term in one grade, and receive special help in overcoming individual difficulties. Still others, though chronologically eligible, should be kept at home or in kindergarten, until their mental age justifies their entrance into the first grade.

The importance of correctly selecting and placing the children of various degrees of mentality at the very outset of their school life, is realized when one considers that a dull child who attempts the same work as a normal child becomes so discouraged by his constant failures, and so overwhelmed by the hopelessness of the task, that it takes years to overcome the resulting lack of self-confidence, and to make him exert his best effort; whereas, the gifted child, for whom the work of the first grade is too easy, forms unfortunate habits of study, becomes uninterested and often troublesome. Meanwhile, taxpayers bear an unnecessary burden when children have to repeat grades or are allowed to spend a whole year on work which might have been done in half the time.

So with the object in view of supplying a possible solution for the problems involved in school promotions, as well as the more immediate purpose of securing a group scale for sorting out subnormal children for the survey, the present series of group tests to be used in primary grades was devised.

Some of these group tests are adaptations of the original Binet-Simon tests; some have been taken from Dr. Kuhlmann's 1917 Revision and others from Dr. Terman's Revision; still others were suggested by tests standardized by the Bureau of Analysis and Investigation in New York; and the rest are original.

The Principles Involved in the Selection of Tests

The requirements of the group test are many, for not only must it possess the characteristics necessary to the individual test, but it must also satisfy various other demands. Simplicity is an important criterion in the selection of the group test: simplicity of material, of directions, of response, and of scoring.

Since a large number of children must be tested at one time, it is necessary that tests be selected in which the material used can be easily carried and quickly distributed. In order to facilitate handling, and to avoid confusion, the writer has ar-

ranged the material for the group tests in booklets. To each child, who has been in school less than one year, i. e., who is in the first grade, and hence can read and write but little, a booklet, 7½ in. x 7½ in., is given, which contains material and blanks necessary for the fifteen tests designated as five, six and seven year tests. Children in the second grade receive similar booklets designed for six, seven and eight year tests; while third grade pupils get booklets for the seven, eight and nine year tests. Thus, all the responses of each child are kept together, and confusion incurred by distributing and collecting loose sheets of paper every few minutes is avoided. All pages of the booklet are numbered, and definite spaces are allotted to each test. All possible elimination of disturbing elements is important, for in the primary grades the attention of the children is easily distracted.

Not only must the material for the tests be simple, but the directions to be followed must be clear and brief. Herein lies the greatest difficulty in selecting tests for a group. Frequently one feels confident that the directions for a certain test are perfectly clear and that they could not possibly be misunderstood, and yet when the test is given to a group of children, he finds that the meaning is entirely lost. Good English must frequently be sacrificed, for the child in the primary grades is surprisingly limited in vocabulary. Originally, in giving the directions for one of the six year tests, the writer said, "Make a cross in the LARGEST square." The result was puzzling, for the children crossed the smallest square as often as they did the largest. The test apparently was a failure for that age group. However, before discarding it, the writer decided to experiment a little to see if the difficulty could be discovered. Instead of having the children cross the square, they were asked to point to the largest square, whereupon one little girl tearfully informed the writer that she "didn't know what that meant." That solved the problem. From then on the children were instructed to "Make a cross in the BIGGEST square," and the success of the test was assured. Brevity is equally essential in giving directions to children, for their habits of thinking, of concentrating the attention, are not yet formed, and to listen, comprehendingly, to long directions is impossible for them. Novelty and change are so obviously important in maintaining the interest and stimulating the child to his best effort, that further discussion of the value of brevity is unnecessary.

In the selection of group tests, only those should be chosen which permit of but one correct response, and that response

must have but one possible interpretation. It is true that some of the tests consist of several trials of the same sort; thus, three different series of five digits each, are read to the children, to be reproduced, but the child passes the test if he succeeds in reproducing any one of the series correctly. This is a necessary procedure, because it is almost impossible, in a group, to have perfect silence while the directions are being given; and so a single series might not be heard by all. Then, too, many children have poor auditory imagery, which fact makes it difficult for them to reproduce material presented orally. However, in all of the tests a response is either entirely correct or it is entirely wrong. This "All or none" method of scoring is used in the writer's group tests, for the purpose of the series is not to discover how much better one child can perform a given task than another, but to see which children fail to perform it at all, i. e., to sort out the subnormal children who need to be given the individual tests before a correct diagnosis can be made regarding their mentality. That the responses must permit of no variation in interpretation, due to the examiner's judgment, is undoubtedly as essential in group tests as in the individual tests.

Altogether, twenty-five tests have been selected which seem to fulfill the requirements mentioned above. These have been divided into groups of five, designated for convenience, as five, six, seven, eight and nine year tests. These have been given to 904 school children distributed according to age as shown in Table I.

TABLE I.

Age	*No. Cases*
6.....(i.e., 5 yrs. 6 mos.....6 yrs. 5 mos. incl.).....	160
7.....(i.e., 6 yrs. 6 mos.....7 yrs. 5 mos. incl.).....	225
8.....(i.e., 7 yrs. 6 mos.....8 yrs. 5 mos. incl.).....	224
9.....(i.e., 8 yrs. 6 mos.....9 yrs. 5 mos. incl.).....	175
10.....(i.e., 9 yrs. 6 mos.....10 yrs. 5 mos incl.).....	120
Total	904

Description of the Tests

Tests for Year V

V, 1. Formboard.

Materials. This is an adaptation of Goddard's[4] formboard. From heavy white cardboard the ten well-known forms are cut. Black paper is pasted over the back of the openings to make them stand out more clearly, and then another sheet of

[4] Goddard: *The Training School.* Vol. IX, No. 4, June, 1912, pp. 49-54.

white cardboard is pasted over all this to form the back. Ten little cards which exactly fit the ten forms, are placed in an envelope pasted on the back of the formcard.

Procedure. The examiner holds up a booklet in front of the group of children to be tested, and says:

> "Open these little books to this black and white card. In the envelope on the back you will find a number of little cards. Take these out of the envelope and put them in a pile on your desk. Now, there is one place in the black and white card into which each of these little cards will exactly fit,—like this. (Illustrate with square.) See if you can find the place for each of the others."

Help may be given any child who has difficulty in finding the place for each card the *first* time. When all the children have the cards properly placed, have them remove them and again place them in a pile on the desk. Then proceed as follows:

> "Now you know where each little card belongs. This time we are going to see who can put all the cards in their places *first*. Everyone wait until I say 'Go,' and then work as fast as you can until I say 'Stop.' Then put your hands in your laps AT ONCE, without touching a single card again. Is everybody ready? Go."

Allow 50 seconds before giving the signal to stop. Care must be taken to see that no child touches a card after he has been told to stop.

Scoring. The test is passed if all ten cards are in their proper places at the end of 50 seconds. A plus or minus, indicating whether the child has passed or not, can be quickly marked on the blank page opposite the form card, by the examiner, before having the children replace the cards in the envelope.

V, 2. Counting 4 Circles. (Lowell)

Materials. A card, 6 in. x 18 in., on which are printed four large circles about 2 inches apart, is necessary, and also two wooden blocks or other small objects. Space for the child to make the crosses is provided at the top of page 2 of the booklet.

Procedure. "When I say, 'Make a cross,' this is what I want you to make. (Make X on the blackboard.) If I should say 'Make a cross for each of these blocks (holding up two blocks), how many crosses would you make? Yes, two,—one for this block, and one for that (XX), see?'

"On this large card are some circles. When I hold the card so you can see them, you are to count the circles TO YOURSELVES, and then make as many crosses up here at the top of your paper (Indicate) as there are circles. Ready. Look." Expose the circles for 10 seconds.

Scoring. The test is passed if four crosses are made.

V, 3. Copying Square. (Binet)[5]

Materials. Use a large cardboard on which an eight inch square is printed in heavy lines.

Procedure. Holding up the large square, and indicating the space in the booklet to be used, the examiner says:

"At this side of the big space, here, see how nicely you can make a square just like this one."

Hold the card so all can see it while they are drawing, and then when they have finished one, say:

"Now see if you can make a still better one at this other side of the big space."

Scoring. The test is passed if one of the two squares drawn is as good as those on the score card used by Binet.

V, 4. Discriminating Colors. (Binet)

Since it is impossible to have children in a group test name colors, the following adaptation of Binet's color test was used. It necessarily makes a different test from the original, since the directions must be comprehended and followed exactly.

Materials. One-half inch squares of the red, yellow, blue and green, are pasted on page 2 of the booklet in the order named.

Procedure. "Look at the colors in the middle of this page. Listen carefully, and then do just as I ask you:

"1. Make a cross *in* the *yellow* square, like this.
"2. Draw a line *through* the *green* square, like this.
"3. Now make a cross *above* the *red* square, like this.
"4. Draw a line *under* the *blue* square, like this."

In order that the child shall understand what is wanted, draw a square on the board each time, and do what you tell the child to do. Give directions slowly, and repeat each.

Scoring. The test is passed if all four colors are correctly marked.

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[5] *Annee Psychologique* (1911) vol. 17, pp. 145-201.

V, 5. Irregular Tapping. (Pintner,[6] Kuhlmann.[7])

The present adaptation has been made from the form used by Dr. Kuhlmann in his 1917 Revision of the Binet Tests.

Material. Use a card, 6 in. x 18 in., on which are printed four squares, about two inches apart. At the bottom of page 2 in the booklet are three rows of squares similar to the one on the examiner's card.

Procedure. "At the bottom of the page you see three rows of squares. The first row looks like this one, doesn't it? (Point to card in hand.) Now I am going to tap some of these squares, like this. (Tap the first two squares with a ruler.) Watch me carefully, and when I've finished tapping, put a cross, like this, X, in just the squares that I tap. Ready. Watch." Then tap the squares in Series A in the order named, at the rate of one square per second, and allow time between series for the child to cross the squares tapped. Always tell the children which row of squares to use for each series.

A) 1-2-4
B) 1-3-4
C) 2-3-4.

Scoring. The test is passed if one of the three rows is correctly marked.

TESTS FOR YEAR VI

VI, 1. Aesthetic Comparison. (Binet)

Material. On each of the pages 3, 4 and 5 of the booklet are two pictures used by Binet for the comparison.

Procedure. "Look carefully at the two pictures on this page (3). Make a cross under the prettier one of the two." Give the same instructions for each of the pages 4 and 5.

Scoring. The test is passed if the prettier face is indicated in two of the three series.

VI, 2. Mutilated Pictures. (Binet)

Materials. The four pictures used by Binet are printed on four successive pages in the booklet, 6, 7, 8 and 9.

Procedure. "Look at this picture. (Page 6.) Part of the face is gone. Let us see what part it is. You see the eyes. Look, the eyes are there. You see the nose. Yes, the nose is there, and look, the chin is there. Now what part is gone?

[6] Pintner: A Scale of Performance Tests — 1917.
[7] Kuhlmann: The Measurement of Mental Development — A School Publication — Faribault — 1917.

(Children name mouth.) Yes, the mouth is gone. Now make a cross right where the mouth should be, to show that that is the part that is gone.

"Look at the next picture. Do not tell me this time what is gone, just make a cross to show me what part is missing.

"Make a cross to show what is gone from the next picture (Page 8.)

"And now show what is gone in the last picture." (Page 9.)

Scoring. The test is passed if the last three pictures are correctly marked.

VI, 3. Counting Irregular Taps. (Kuhlmann)

Materials. The examiner needs a wooden block or the blunt end of a pencil for tapping. Ruled blanks are provided the children on page 10 of the booklet.

Procedure. "Listen. I am going to tap on the table and see if you can count the number of taps. You count to yourselves, and give me the number when I ask you. Ready."

Tap 5 times, at the rate of one tap per second. See that the hand is screened, while tapping, by a large cardboard.

"How many times did I tap? Five, that is right. Now, instead of telling me how many times I tap, I want you to make a cross for each tap, when I get all through. I just tapped five times, so how many crosses shall I make to show it? Yes, five, like this: XXXXX.

"Sometimes I will stop tapping and then begin again. Don't let that fool you. You count only those you hear, and when I ask how many, you will make one cross for each tap, here, on this first line. (Indicate line each time.) Ready. Listen."

Tap the following series in order, at the rate of one tap per second, for each cross, and pausing a second for each dash:

1) XX-XX (4)
2) X-XX-XXX (6)
3) XXX-X (4)
4) XX-XXX-X (6)
5) X-XX-X-X (5)

Scoring. The test is passed if 3 out of the five series are correctly counted as indicated by the correct number of crosses.

VI, 4. Two Simultaneous Commands.

This test was suggested by Binet's test in which three simultaneous commands were used.

Materials. One row of circles and a row of squares of different sizes are provided for the children on page 10 of the booklet.

Procedure. "See these squares and circles. Listen carefully and see if you can remember what I am going to ask you to do with them, when I am all through telling you.

"Make a cross in the BIGGEST square.
Then draw a line in the FIRST circle.

"I will tell you once more, and then see if you can do both things. Listen:

"Make a cross in the BIGGEST square,
Draw a line in the FIRST circle."

Scoring. The test is passed if both directions are correctly followed.

VI, 5. Perception of Sound. (Lowell)

Material. A bean-bag, a baseball, a penny, a pencil, a key, and a wooden block are used. Have a table which can be concealed from the children and from which the above named objects can be dropped. A card picturing each of the objects with respective symbols to be drawn by the children, is tacked up in view of the children. See Fig. I. Space for six drawings is provided at the bottom of page 10 in the booklet.

Procedure. "What is this?"

Hold up each of the objects and have the children name it.

"Now look at this card (Fig. I), and tell me what each of these pictures is. (Have them name them all.)

"Now I am going to drop each one of these on the floor where you cannot see it, and I want you to listen to the noise each makes, and see if you can tell which of these I drop.

"If I should drop the bean-bag first, you would draw, in this first space, here, this. (Point to symbol at the side of the picture of the bean-bag); if I dropped the key next, you would make this X in the second space, here; if I dropped the penny next you would make this line in the third space, etc.

"Now shut your eyes, and see if you can tell from the sound which one of these I drop, and then look at the card to see what to draw. Then draw that in the first space. Ready. Listen."

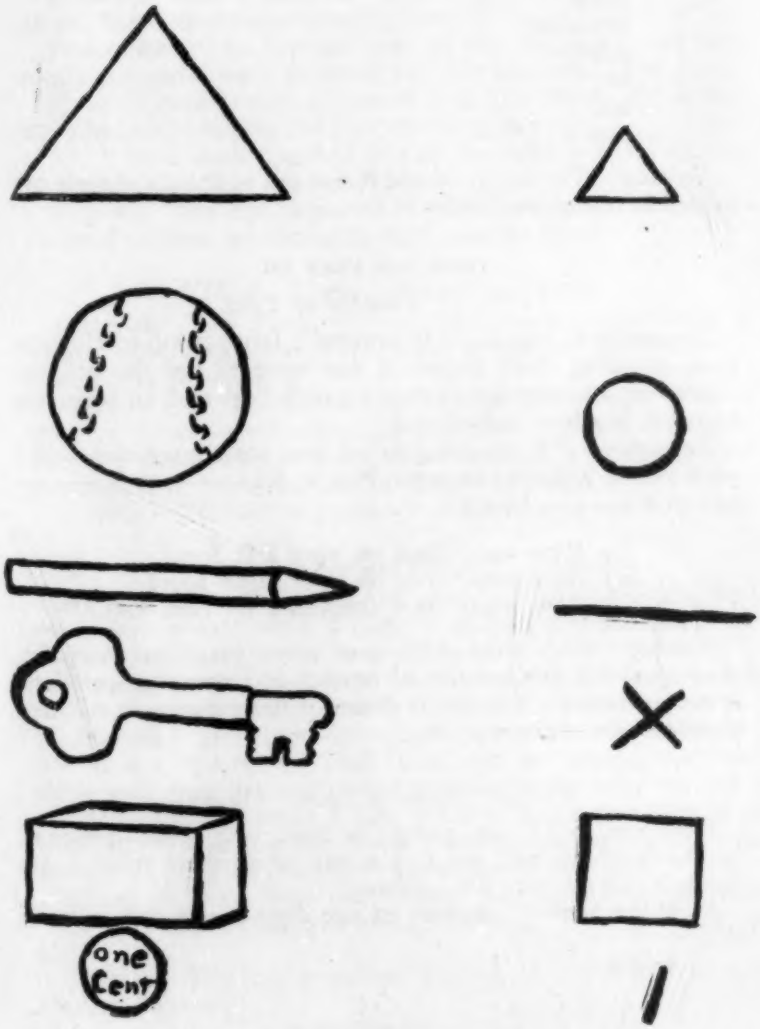

FIGURE I. (vi, 5)

Drop objects in the following order:

block
bean-bag
penny
key
ball
pencil

Scoring. The test is passed if five out of the six objects are named in the correct order.

TESTS FOR YEAR VII

VII. 1. Number of Toes.

Because it is impossible to prevent a large group of children from counting their fingers if one were to use the original Binet test, the number of toes on each foot and on both feet together, has been substituted.

Procedure. "I am going to ask you some questions, and I want you to write the answers, here at A)———, at B)——— and at C)——— Ready:

A) How many toes on your left foot?
B) How many toes on your right foot?
C) How many toes altogether on both feet?"

Scoring. Since most children of seven years can make figures up to 10, further use of crosses in answering questions is not permitted. The test is passed if the answers to all three questions are correct.

VII, 2. Memory Span. (Binet)

Procedure. "I am going to read you some numbers. Listen carefully, and see if you can write them when I get through just the way I read them."

Read the digits at the rate of one digit per second, without rhythm.

"Listen:

A) 6-5-2-8-1
B) 4-9-3-7-5
C) 2-8-6-1-9"

Scoring. The test is passed if the digits in one series are correct, even though their order be changed.

VII, 3. Copy Diamond. (Binet)

Material. Use a card on which a large diamond, 9 in. x 18 in., has been drawn in heavy lines.

Procedure. "At the left side of this big space, see how nicely you can draw a diamond just like this one."

Hold the card so that all can see it as they draw. After they have finished drawing the first diamond, say:

"Now draw another one at the right side of the big space just like this one."

Scoring. The test is passed if one of the two drawings is as good as those on the score card used by Binet.

VII, 4. Tying Bowknot. (Binet)

Material. Two pieces of tape, each about seven inches in length, are fastened to a stiff card pasted at the bottom of page 11, in the booklet.

Procedure. "You know what kind of a knot this is, don't you? (Show them bowknot already tied). Yes, it is a bowknot. I want you to tie the same kind of a knot with the pieces of tape you have, just as quickly as possible."

Scoring. The test is passed if a bowknot is correctly tied.

VII, 5. Geometrical Figures. (Lowell)

Material. Use five cards, on which are printed, in a different order, on each card, a circle, a square, a cross, and a triangle. See Fig. II.

Procedure. "I shall show you some cards for ten seconds each. On each card you will find these forms. (Draw on blackboard.) But the order in each case will be different. On one card a square will come first, and on another card the circle will come first, etc. You will notice carefully the order of the forms, and when I take the card away, you will draw what you saw in just the order it was on the card. Draw as quickly as possible. Ready. Look at the first card."

Allow no more than one minute for reproducing a card.

Be sure all children are giving attention when you hold up a card.

Scoring. The test is passed if three of the five series are correctly drawn.

TESTS FOR GROUP VIII

VIII, 1. Ball and Field. (Terman)

Material. The incomplete circle used by Terman to represent the baseball field, is printed in the booklet.

Procedure. "Let us suppose that your baseball has been

lost somewhere in this round field. You have no idea what part of the field it is in. All you know is that the ball is lost somewhere in this field. You are to mark out a path to show me how you would hunt for the ball so as to be sure not to miss it wherever it might be. If you draw just a line to the center from the gate, like this,—it would mean that you only looked that far and then stopped,—and the ball might be away over at the other side; you don't know where it is. Now

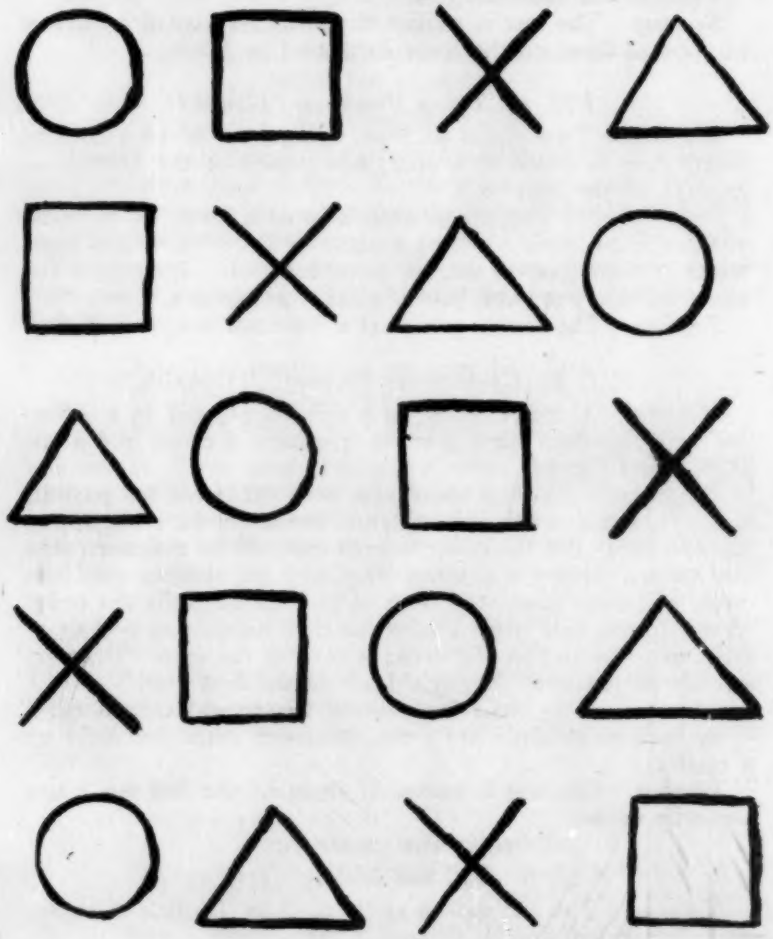

FIGURE II. (vii, 5)

begin at the gate, and with your pencil mark out a path to show how you would hunt for the ball so as to be sure not to miss it."

In giving an individual child this test, according to Dr. Terman's directions, the examiner watches what the child draws, and if he stops after drawing just a short path, the examiner asks him where he would go next if he hadn't yet found the ball. As such procedure is obviously impossible with a large group of children, the illustration is used in the directions.

Scoring. The test is passed if the child shows a plan as good as those shown on Terman's score card for eight-year-old children.

VIII, 2. Writing from Dictation. (Binet)

Procedure. "I want you to write something for me as nicely as you can on this long line. Write these words: 'See the little boy.' Be sure to write it all: 'See the little boy.'"

Scoring. The test is passed if the sentence is written legibly enough to be easily read, and if no words are omitted. Unless a word is so incorrectly spelled as to make it unrecognizable, the error is not counted.

VIII, 3. Counting the Value of Stamps. (Binet)

Material. Use a cardboard on which have been pasted three one-cent stamps in a row at the top, and three two-cent stamps in a row under these.

Procedure. "Write the answer to this question on the short line here." Hold the card before the children and say:

"How much will it cost to buy all these stamps? A green stamp is worth one cent, and a red stamp is worth two cents. Now, how much are they worth altogether?"

Scoring. Test is passed if the answer, 9 cents, is given.

VIII, 4. Comprehension Test. (Kuhlmann)

Material. Three one-inch squares are printed in the booklet on page 3.

Procedure. Point to the parts as you mention them.

"See this first square. This is the *center* of the square. What is it? This is the *upper right corner* of the square. What is it? This is the *lower left corner.* What is it? This is the middle of the *left side of the square.* What is it?

"Now take your pencils, and draw a straight line from the center of the first (second and third) square to:

1) The upper left corner.

2) The middle of the upper side.
3) The lower right corner of the square."

Scoring. The test is passed if two of the three lines are correctly drawn.

VIII, 5. Estimation of length of lines. (Kuhlmann)

Material. On separate pages of the booklet are drawn three lines. The first line, drawn vertically in the center of the page, is three inches long; the second line, similarly drawn on another page, is two and one-fourth inches long; and the third line, drawn horizontally, and having two curves, is three inches long.

Procedure. "I want to see how well you can judge the length of lines without a ruler or even your pencils to help you measure. Look at this line carefully, and then draw a line under it here, horizontally, i. e., from left to right like this, (hold pencil where line is to be drawn), which is

1) Just as long and no longer than this line.

"Now look at this next line. Draw a line under it, here, horizontally, which is:

2) Just twice as long as this one.

3) "Let's play that this is a piece of string. If I could take hold of the ends of it, and pull the string out straight, how long a piece would it be? Draw a straight line here, to show how long it would be." (Point to space under the curved line.)

Scoring. The test is passed if two of the three lines are drawn within one-half inch of the required length, i. e

1) 3 in.
2) 4½ in.
3) 3 in.

TESTS FOR GROUP IX

IX, 1. Drinking Cup. (Bureau of Analysis, etc., N. Y.)[8]

Material. A square of white paper, 7½ x 7½ in.

Procedure. "I am going to show you how to make a drinking cup, and when I finish, I want you each to make one just like it. Watch carefully.

1st: Fold the square through the center like this.

2nd: Take the right hand corner and fold it over to the opposite side so that these two edges are equal.

[8] New York State Board of Charities, Bureau of Analysis and Investigation: Eleven Mental Tests Standardized, 1915, *Eugenics and Social Welfare Bulletin* No. V. p. 42.

3rd: Next, take the other corner on the left side, and fold it over the same way so that the edges come straight across.

4th: Then, fold down this flap, and put it into this outer space to hold it.

5th: Now fold down the top flap for a cover, and you see how the cup looks.

"You take your square of paper now, and make one."

Scoring. The test is passed if the five folds of the drinking cup are correctly made.

IX, 2. Maze. (Porteus)[9]

Material. The maze used by Porteus for nine year children, is printed in the booklet. See Fig. III.

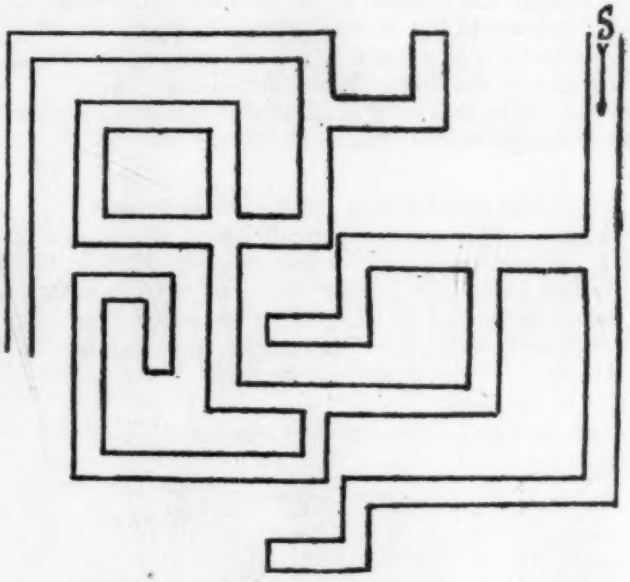

FIGURE III. (ix, 2)

Procedure. "Here you have a maze. Some of these paths are open, so you can get through, and some are closed at the ends. See how quickly you can find the shortest way out, without getting into any of the closed paths. Start where you

[9] Porteus: Mental Tests for Feeble Minded; *Journal of Psycho-Asthenics*, Vol. 19, No. 4, June, 1915, pp. 200-213.

see the letter *S*, and mark out the very shortest path you can find in order to get out over here on the other side. Do not stop to erase anything. If you make a mistake, just draw a line across it and go on as fast as you can."

Scoring. The test is passed if the shortest path is marked out in one minute, with not more than two errors. An error consists of a line, however short, drawn out from the shortest path.

IX, 3. Tapping Squares. (Whipple)[10]

Material. A sheet of paper is used on which a rectangle has been printed. This rectangle is divided into 150 half-inch squares, arranged in ten rows of fifteen squares each.

Procedure. "Please take your pencils and hold them firmly about half way up. Place your arm comfortably on the desk so that it may bend freely at the elbow. Now when I say, 'Ready,' you are to tap as many squares as you can, in order, without hitting any square twice, or missing a square, or touching any of the lines. Work until I say 'Stop.'"

Scoring. The test is passed if 50 squares are correctly tapped in the 30 seconds allowed.

IX, 4. Alphabet Test. (Kuhlmann)

Procedure. "Of course you all know the letters of the alphabet, a-b-c-d-e etc. Who can tell me what is the first letter before 'C'? (B). Now who can tell me what is the sixth letter before 'X'? (R). Let us put this one on the board, R-S-T-U-V-W-*X*. Notice that W would be the first letter before X, V the second, U the third, T the fourth, S the fifth and R the sixth.

"I will give you 30 seconds to answer each one of these questions.

1)	What	is	the	3rd	letter	before	K	(H)
2)	"	"	"	5th	"	"	W	(R)
3)	"	"	"	2nd	"	"	F	(D)
4)	"	"	"	1st	"	"	Q	(P)
5)	"	"	"	4th	"	"	E	(A)"

Always write the letter to be used as a basis on the board, so that the children will not misunderstand.

Scoring. The test is passed if three of the five letters are correct.

[10] Whipple: *Manual of Mental and Physical Tests,* 1910. pp. 100-115.

IX, 5. Memory Test. (Kuhlmann)

Procedure. "I am going to write five words on the board, and let you look at them for a few seconds. Then I will erase them and write five others and let you look at them, and so on with the other series. When I am through, I will give you the first word of a series, and you are to write down from memory, the other four words that go with it. Then I will give you the first word of the next list, and you will write the four that go with that one, etc. You must not write down any until I tell you to."

Let them look at each series for 30 seconds, then erase and take the next. Give them 30 seconds to recall each list. The lists are:

Silver	red	kitchen	blackboard	lawn
spoon	cow	stove	teacher	grass
table	fence	flour	desk	tree
bread	clover	water	slate	house
fork	dog	spoon	lesson	walk

Scoring. The test is passed if the child gives three series without more than one error in each. An omission counts as an error.

Difficulties of Administering Group Tests

Many problems, which from their very nature can never be entirely eliminated, arise in giving group tests to the primary grades. Some of these difficulties are due to the distractibility of young children, to their inability to comprehend directions readily, to their undeveloped moral sense, to the attitude of the teacher, and to the apparent inhibition of response which the nervous child exhibits.

The inability of the young child to attend to set problems for any length of time is a serious difficulty. It necessitates devoting almost the entire first year of his school life to the formation of habits of work, of play, of thought and of living. Up to the time of his entrance into school, he is permitted to eat, sleep, and play largely at will, but with the beginning of his educational career he is expected to live according to a more or less definite plan, regardless of his own wishes or pleasures. When a stranger tries to test forty such children, before regular habits have been formed, the difficulties encountered may easily be imagined. Usually, the children are sufficiently shy and timid not to need disciplining, but sometimes that very timidity prevents them from being responsive at first. Therefore, their confidence must be won by the time

the booklets are distributed and the examiner is ready to begin the testing. The fact that the children are not permitted to look through the pages except as they use them for the tests helps to keep up the interest. When the booklets are finally distributed, the directions for the first test given, the children attentively (?) awaiting the signal to begin work, and then a little voice in the corner confidentially informs one that "My sister has some gold beads just like yours," the examiner wonders if he can ever be sure of a child's attention.

The difficulty experienced by young children in comprehending directions has been discussed under the "Selection of Tests." Frequent illustrations, full and explicit directions with numerous repetitions, all help the child in understanding what he is to do. However, ability to comprehend and follow directions accurately, is a test of intelligence, and too many or too great a variety of instructions may destroy the value of the test.

In order to stimulate the child to his best effort, one appeals to his competitive instinct, his sense of rivalry. This has its disadvantages, for the child in his eagerness to do better than his neighbor, or to get a word of praise from the examiner, resorts to methods "fair or foul." It is generally agreed that the young child is non-moral. The disapproval of the group has not been experienced sufficiently to make a lasting impression; and so the child slyly copies from his neighbor, or covertly writes on his desk the digits which are being read. To guard against such conditions as these, the writer has used various devices. Some have been mentioned under *Procedure,* such as having the child place his hands in his lap the instant he is given the signal to 'Stop;' cover his work with his hands as soon as he has finished the task assigned; or, in the digits test, place the pencils on the desks and leave them there until told to write. In one or two instances, where the attention had several times been called, without effect, to the fact that someone in the room was not playing fair, more drastic measures have been taken, such as speaking to the child by name, or changing his seat. However, as most children are very sensitive to criticism, such measures are seldom necessary.

Frequently a teacher, not knowing the object of the group testing, feels that unless the pupils respond well to the tests, her reputation as a teacher will be at stake. In her anxiety to have the children make a good showing, she offers suggestions which help them. For example, when trying out various tests for the nine-year group, the writer used Terman's test

of finding all the words that rhyme with "Day, mill and spring." In one third grade, the teacher felt that the children were not responding as readily as they should, so with much irritation she spoke to the class. "Why, children, you know how we have been finding words to go in the 'ING' family, so I don't see why you can't find others like 'Day' to go in the 'AY' family." Of course the children could find words after that, but the test, as such, had lost its value. To avoid such incidents, the examiner should explain to the teacher at the outset that the purpose of the work is to see what each child can do by himself, without any suggestions from her.

So far, no difficulty has been experienced in securing the proper attitude on the part of the child, for the interest and novelty of the tests counterbalance any temperamental disturbances. However, it has been evident in the cases of several nervous children that the excitement produced by the competition, novelty and mental effort has inhibited responses, especially where the test has a time limit. If a pupil happens to be an only child and has not yet learned to adapt himself to an environment in which there are many children, he may fail to make an average score in the group tests, though when tested individually he may test even above normal.

Table of Norms and How to Use It.

If group tests are to be of value in selecting subnormal children, the number of tests passed by an individual must correlate with his age and intelligence. Table II shows the average number of tests passed by children of each chronological age and of the various I. Q.'s found in Grades I, II, and III.

As shown by the above table, the chronological ages of the children ranged from six to twelve years. By six years is meant all ages from five years six months to six years five months, inclusive; by seven years is meant all ages from six years six months to seven years five months, inclusive; etc. In order that the average number of tests passed by children of any age might serve as an index of their intelligence, individual I. Q.'s were obtained by means of Dr. Kuhlmann's 1917 Revision of the Binet tests, and then the average number of group tests passed for these various intelligence quotients and for each chronological age was computed. Thus, in using the table of norms in classifying an individual case,

TABLE II

NORMS. AVERAGE NUMBER TESTS PASSED AT VARIOUS AGES AND GRADES

Grade I. (Group Tests V—VI—VII.)

I. Q.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.
.70	2.0	4.6	6.2	8.3	....	....
.80	4.3	6.6	9.6	11.1	....	....
.90	6.1	8.4	11.8	....	....	....
1.00	7.7	11.2	14.5	....	....	....
1.10	8.2	12.6	....	....	....	....
1.20	10.5	14.0	....	....	....	....
1.30	13.0	15.0	....	....	....	....

Grade II. (Group Tests VI—VII—VIII.)

I. Q.						
.70	....	....	7.3	8.6	10.1	....
.80	....	....	8.8	11.0	12.0	....
.90	....	8.6	9.9	12.4	14.2	....
1.00	....	9.6	11.4	13.7	....	....
1.10	....	10.1	12.5	14.5	....	....
1.20	....	11.5	13.5	....	....	....
1.30	12.0	13.3	....	....	....	....
1.40	13.4	15.0	....	....	....	....

Grade III. (Group Tests VII—VIII—IX.)

I. Q.						
.70	....	....	....	8.0	9.8	10.3
.80	....	....	8.5	9.2	10.8	11.6
.90	....	....	9.5	10.2	11.9	....
1.00	....	....	10.0	12.0	13.0	....
1.10	....	....	12.0	13.5	14.2	....
1.20	....	....	13.1	14.6	....	....
1.30	....	12.0	14.2	....	....	....
1.40	....	14.0	....	....	....	....

one compares the number of group tests passed by him with the average number of tests passed by children of the same grade and chronological age, and finds the average in the series and its corresponding I. Q., with which his score agrees. For example, if an eight-year-old child in the first grade passed only seven tests, his score would lie between the average for children of his age who had an I. Q. of .70, namely 6.2 tests, and the average of those with I. Q. of .80, or 9.6 tests. This would give him a group I. Q. of .72. Since such a rating would place him in the sub-normal group, he should undoubtedly be given the individual Binet tests, in order that his mental status be accurately gauged.

Reliability of the Group Tests

In order to determine the reliability of any series of tests, the data must be considered from various points of view. The aspects which will be discussed in connection with the reliability of the present scale are; *first,* the discriminative capacity of the tests, i. e., their ability to distinguish between children of various ages, as shown by the increase in the per cent passing the tests for successive chronological ages; *second,* the percentage of children passing "at age," i. e., the percentage which will cause average six-year-olds to show a mental age of six years, average seven-year-olds to show a mental age of seven years, etc., as compared with the percentage passing at age in the individual tests; *third,* the ability of the group tests to discriminate between various mental ages in three school grades where the same group of tests has been given; *fourth,* the correlation between group and individual tests, as calculated by Karl Pearson's method; *fifth,* the agreement between group test results and school attainment; and *sixth,* the correlation between the writer's scale and an "Absolute Point Scale," [11] when used on the same children.

The Increase in Per Cent Passing for Successive Chronological Ages

The discriminative capacity of group, as well as of individual tests, is measured by the increase in the percentage of children passing the tests from one age to the next. The greater the increase in the percentage passing any test from one age to the next, the higher is the discriminative capacity of that test.

Table III compares first, the percentage passing at age for each test in the five age groups, with the percentage of children, chronologically a year older, passing each test; and second, it compares the per cent increase from one chronological age to the next as found in the group tests, with the per cent increase found by Kuhlmann [12] and Terman,[13] where they have used the same tests in their revisions as individual tests. For example, 66 per cent of the six-year-old children passed the aesthetic comparison test (VI,1) when given in the group, and 75 per cent of the seven-year-olds passed it, thus giving

[11] G. Arthur and H. Woodrow: An Absolute Point Scale. *J. Appl. Psychol. Vol.* 3, 1919, pp. 118-137.

[12] These figures were taken from results in Dr. Kuhlmann's 1912 revision, in which the tests had not been correctly placed in the scale.

[13] Terman's results as quoted are taken from the data published in 1917 on the Stanford Revision.

an increase from one age to the next of 9 per cent. When Kuhlmann used it as an individual test, he found an increase of 4 per cent passing from ages six to seven, and Terman found an increase of 6 per cent at the same ages.

TABLE III

INCREASE IN PER CENT PASSING FOR SUCCESSIVE CHRONOLOGICAL AGES

Group V	Yr. 6 (121 cases)	Yr. 7 (135 cases)	% Increase	Individual Kuhlmann	% Increase Terman
1. Formboard	65	84	19	..	..
2. Counting 4 Circles	66	87	21	1	..
3. Copying square	85	95	10	..	..
4. Discriminating Colors	72	81	9	..	9
5. Irregular Tapping	70	85	15	..	..

Group VI.	Yr. 6 (122 cases)	Yr. 7 (136 cases)	% Increase	Individual Kuhlmann	% Increase Terman
1. Aesthetic Comparison	66	75	9	4	6
2. Mutilated Pictures	63	74	11	6	15
3. Irregular Taps.	60	88	28	..	..
4. Two Commands	54	75	21	..	..
5. Perception of Sound	51	74	23	..	..

Group VII.	Yr. 7 (95 cases)	Yr. 8 (198 cases)	% Increase	Individual Kuhlmann	% Increase Terman
1. No. of Toes	70	88	18	17	9
2. Memory Span	63	81	18	3	6
3. Copy Diamond	84	92	8	11	18
4. Tying Bowknot	72	81	9	..	16
5. Geom. Figures.	61	76	15	..	..

Group VIII.	Yr. 8 (199 cases)	Yr. 9 (174 cases)	% Increase	Individual Kuhlmann	% Increase Terman
1. Ball and Field	70	79	9	..	7
2. Dictation	78	87	9	..	8
3. Value of Stamps	70	84	14	20	17
4. Comprehension Test	72	81	9	..	..
5. Length of Lines	69	81	12	..	..

Group IX.	Yr. 9 (106cases)	Yr. 10 (112cases)	% Increase	Individual Kuhlmann	% Increase Terman
1. Drinking Cup..	67	78	11	..	..
2. Maze.....	73	83	10	..	..
3. Tapping Squares.....	70	79	9	..	..
4. Alphabet Test.	73	83	10	..	..
5. Memory Test..	60	71	11	..	..

Unfortunately, there are no other similar group tests published, with which the writer's percentages passing the various tests can be compared. However, there is about as much variation existing between the data from the two revisions of the Binet Scale as between the individual and group results.

Per Cent Passing "at Age" in Individual and Group Tests

Considerable difference exists between the percentage of children passing "at age" in the group and in the individual tests. Kuhlmann has found that a much higher percentage of young children pass "at age" than of the older ones; thus, he found that 88 per cent of the four-year-old children pass the four year tests, whereas only 54 per cent of the twelve-year-olds pass the twelve year tests. However, in the group tests, the writer finds as small a percentage of six and seven year children passing six and seven year tests, as of nine-year-old children passing the nine year tests. Table IV compares the percentages passing "at age" as found by Kuhlman[14] in the Individual Tests with those by the writer in the Group Tests. Thus, 78 per cent of the six-year-old children pass the six year Individual Tests, and only 60 per cent of them pass the six year group tests.

TABLE IV

Per Cent Passing at Age in Individual and Group Tests

C. A.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs
Kuhlmann—Individual Tests.	78	73	68	64
Lowell—Group Tests.....	60	69	72	68

The explanation of these differences in the six and seven year results may be found in the fact that a group test is largely a matter of comprehending and following directions

[14] These figures were given me through the courtesy of Dr. Kuhlmann, from his manuscript of *"The Measurement of Mental Development, a further Extension and Revision of the Binet-Simon Tests"* to be published soon.

presented orally, without any individual help for individual needs. If a child has not been accustomed to doing things in a group, he will be easily distracted. Then, too, the younger the child the less capable he is of following instructions; but with each additional year of experience, and with an increasing mental age, the performance of tasks become easier. The effect of these two factors, namely, increasing mental age and increasing number of years in school, on the number of group tests passed, is shown in Table V.

TABLE V

RELATION OF M. A., NO. YEARS IN SCHOOL AND AV. NO. OF VII YEAR GROUP TESTS PASSED

M. A.	Average Number of Tests Passed in: Grade I	Grade II	Grade III
4— 4.9 years	0	...	...
5— 5.9 years	0.7	1.0	...
6— 6.9 years	1.2	3.0	3.3
7— 7.9 years	2.7	3.4	4.4
8— 8.9 years	4.0	4.3	4.5
9— 9.9 years	...	4.5	4.5
10—10.9 years	...	...	4.5

The data for the above table was obtained by testing 277 children individually, with Kuhlmann's 1917 Revision,—thus getting their mental ages. Then the average number of tests in the VII year group—this group was the only one of the three which was given in all three grades—passed by children of the various mental ages, was found for each grade. Thus, children with a mental age of 6—6.9 years, who have been in school less than one year,—that is, who are in the first grade, on the average pass 1.2 tests of the VII year group; children of the same mental age who have been in school nearly two years, or are in the second grade, pass 3 tests; and those in the third grade, of the same mental age, pass 3.3 tests. So, with each additional year in school the number of tests passed increases, even though the mental age remains constant. On the other hand, with the "time in school" factor constant, but with increasing mental age, one also finds an increase in the number of tests passed. Thus, in grade I children whose mental age is 4—4.9 years will not pass any of VII year tests; those whose mental age is 5—5.9 will average 0.7 of a test; whereas those having a mental age of 8—8.9 will average 4.0 tests.

These facts seem to indicate that two important principles are involved in the group responses of primary children.

First, that the distractibility, so noticeable in kindergarten and first grade children, gradually decreases with each additional year of group or school performance, until it becomes, in the third grade, a negligible factor. In other words, the individual third-grade child has had time to adjust himself to his new environment, and to realize through frequent encounters with other members of the group, that his wishes and his behavior must conform to theirs. Second, mental age is an important consideration. This is true, however, only in so far as the work is sufficiently difficult to require effort on the part of the individual. Thus, in the third grade, taking carelessness and chance error into account, the maximal performance is reached, for the VII year tests, at a mental age of eight. Further increase in mental age does not improve the average eight year score.

Correlation Between Group and Individual I. Q.'s.

Since the standardization of the group tests has been completed, the writer has given the group tests to 153 children in the primary grades and found their group I. Q.'s. Then all of these children were tested individually by Kuhlmann's 1917 Revision of the Binet tests, and their individual I. Q.'s worked out. The coefficient of correlation, computed by Karl Pearson's method, for the two series of I. Q.'s is .77.

Group and Individual I. Q.'s vs. School Attainment

Individual records in group tests form a basis for promotion in primary grades, for the results obtained by group tests agree more closely with school attainment than do the results obtained by individual Binet testing. As a rule, children who give poor response to group tests, do poor school work, while those who obtain group I.Q.'s above 1.10 are capable of special promotion.

On the basis of Terman's [15] classification of normal or average children, namely, those having I.Q.'s from .90 to 1.10, the 153 children mentioned above were grouped into three classes. Those having individual I.Q.'s below .90 were called dull, those with I.Q.'s from .90 to 1.10, inclusive, were considered average or normal, and those with I.Q.'s above 1.10 were classed as superior. Then these cases were redistributed, on the basis of group I.Q.'s, into the same three classes. A comparison of the results is given in Table VI.

[15] L. M. Terman: *The Measurement of Intelligence*, 1916, p. 94.

Table VI

CLASSIFICATION OF 153 CASES BY GROUP AND INDIVIDUAL I. Q'S.

By:	Dull (Below .90) No. Cases	Average (.90 to 1.10) No. Cases	Superior (1.10+) No. Cases
Individual I. Q.'s....	27	80	46
Group I. Q.'s.....	49	66	38

By this table, one notes that 22 more cases are rated as dull by the group scores than by the Binet I.Q.'s. School records of these 22 children offer the following bits of information·

Case 1. RR.[16]
Case 2. Very poor school work, Marks average 70-76.
Case 3. R.
Case 4. RR.
Case 5. Deaf,—hence class work unsatisfactory.
Case 6. RRR.
Case 7. School work just passing—even with aid of special help.
Case 8. R.
Case 9. Conditioned in grade. Neuropathic heredity. Does nothing in group, and only with much coaxing can information be elicited when the child is alone.
Case 10. R.
Case 11. R.
Case 12. Father of child f.m.— one brother an idiot — an aunt an idiot.
Case 13. R.
Case 14. R.
Case 15. Has very poor comprehension. Has to have much individual help.
Case 16. R.
Case 17. R.
Case 18. RR.
Case 19. Stammers very badly.
Case 20. Conditioned. Can only make grade with individual help.
Case 21. R.
Case 22. R.

[16] R = repeated work of grade.
RR = repeated twice the work of the grade.
RRR = repeated three times the work of the grade.

Of the 66 cases classed as normal by the group tests, 53 receive a similar rating by the individual tests, and the other 13 were classed as superior. One must remember in this connection that a difference in an I.Q. of one point may change a child's rating from dull to normal or from normal to superior. For instance, a group I.Q. of 1.10 will place a child in the normal group, whereas an individual I.Q. of 1.11 would classify him as superior, and vice versa. A difference in classification due to a difference of 3 points or less between group and individual I.Q.'s occurred in 5 of the 13 cases mentioned above. The school records of the other eight give the following comments:

Case 1. Slow to respond. Never volunteers to recite in class.

Case 2. Schoolwork inferior to Individual I. Q. Does poor team work.

Case 3. Lazy and careless — will not work if possible to avoid it.

Case 4. Doesn't work well in group — wants attention centered on self.

Case 5. Has been in school less than one year. Spent one day in each of Grades I and II and then was located in grade 3B.

Case 6. R.

Case 7. Can't adjust to conditions in a group either at work or play. Is irritable and nervous. Mother insane.

Case 8. R.

Agreement is very close between Group and Individual ratings of the superior group. One interesting case is found on school records for this class, namely that of a child who was doing such good school work that the teacher recommended a special promotion for him, although his I. Q. as determined by the Binet tests did not warrant it. In view of his excellent school work, and of the fact that when given the group tests his score placed him in the superior group, the child was given the extra promotion. He has been in the new grade nearly two months and is still doing superior work.

Careful consideration of available school records seems to indicate and in fact, to emphasize a closer agreement between group test results and school attainment than between Binet scores and school work. Such a correspondence is to be expected, however, when one realizes that the principles involved both in group testing and in school work are fundamentally the same.

Correlation Between Two Group Intelligence Scales

While the present writer has been devising and standardizing a group intelligence scale by the "all-or-none" method, an "Absolute Intelligence Scale"[17] has been constructed in which a point method has been used. Nine well known types of tests have been used, namely:

1) Immediate Memory Span
2) Easy Opposites
3) Hard Opposites
4) Substitution
5) Word Building
6) Language Completion
7) Anagrams
8) Cancellation
9) Comprehension

Without discussing the mathematical calculation of their points, a fairly accurate idea of the general plan of the scale may be obtained from the following quotation:

"The quotients which we have termed discriminative values represent an absolute increase in ability from one age to the next, for their respective tests. ———— The final absolute intelligence scale is ———— secured simply by adding together the point scales of the individual tests. The normal absolute intelligence for any age is simply the sum of the normal point scores of that age for all nine tests."

This point scale differs from the all-or-none scale in practically every detail except that both are Group Intelligence Scales, and both can express their scores in terms of intelligence quotients. The two series of tests were given to a group of 77 children, and I. Q.'s for each scale computed. The coefficient of correlation between the two groups of I. Q.'s is 0.76 (Karl Pearson.)

Summary

The present group scale offers a means for measuring the intelligence of large groups of children accurately enough to sort out all children of questionable normality. It also forms a basis for school promotion and demotion in the primary grades.

It consists of 25 tests, arranged in groups of five, and for convenience, called five, six, seven, eight and nine year tests.

[17] Grace Arthur and Herbert Woodrow: An Absolute Intelligence Scale. The writer is indebted to Miss Arthur and Dr. Woodrow for their cooperation in comparing group results and for making their data available for the writer's purposes.

The tests have been standardized on the basis of results obtained from 904 children of the ages five years six months to ten years and five months, inclusive.

The uncorrected coefficient of correlation (Pearson) between measurements made, in terms of intelligence quotients, by the Group Scale and by Kuhlmann's 1917 Revision of the Binet Tests is 0.77.

The group results form a more accurate index of the child's performance, than do the individual results obtained by the Binet tests.

The uncorrected coefficient of correlation between two series of I. Q.'s obtained for 77 children by the present group scale and by "An Absolute Point Scale" is 0.76.

A STANDARDIZED TEST FOR OFFICE CLERKS

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The clerical examination here reported has been taken by about five thousand office clerks and has been standardized by the Phoenix Mutual Life Insurance Co., the Equitable Life Assurance Society, the Westinghouse Electric & Mfg. Co., the Bell Telephone Co., Western Electric Co., Strawbridge & Clothier, Armstrong Cork Co., and others.

In devising a vocational test the psychologist should be guided by three fundamental considerations affecting the content of the test. 1) The difficulty of the content should correspond to the intelligence level of acceptable candidates. 2) The content should have an interest appeal to candidates who would be interested in the work tested for. 3) The special abilities should be represented in the test if there are any demonstrable special abilities. I do not believe that office work has any special abilities that have so far been demonstrated and hence I have confined myself to the first two criteria; namely, an appropriate intelligence level and content that appeals to the applicant for an office position. This reduces itself to the same type of problem that we find so frequently in preparing vocational tests; namely, the preparation of an intelligence test out of relevant content.

In deciding on the length of a vocational test we may be guided by two diametrically opposed considerations. If we have in mind the convenience of the interviewer or examiner in the employment office we should be tempted to use a short ten-minute test. So many distracting influences may appear in ten minutes and so much depends on the candidates " warming up " to the test that I should hesitate rejecting an applicant on what he does in a ten-minute interval. However, a ten-minute test is diagnostically more valuable than a ten-minute interview and if the two are combined, so much the better. The opposite consideration is that if no test is given, the applicant is put to work under more or less informal observation, and if the supervision is at all adequate it will appear during the course of a week or two whether the new employee is unusually capable. But two or three weeks repre-

sent many hours, not minutes. Now, why should we not give the employee a *standardized sample office job* which requires about 45 to 60 minutes? By means of a sample office job which has been standardized we may know more about the candidate's capacity for a variety of office jobs than can possibly be judged from a short list of opposites or other brief general intelligence test. These are some of the assumptions on which the clerical examination was devised.

The following is a brief description of the eight parts of the examination.

A. In this part the candidate checks the errors in addition and subtraction. There are only a few errors on the page of 120 additions. The small number of errors is intended to duplicate actual office conditions in which errors are even at worst more infrequent than correct answers. The careless candidate sees so many of the additions correctly performed that he does not scrutinize each item sufficiently to discover the errors.

B. In this part the candidate reads a section of Arnold Bennett's "Mental Efficiency" in which about forty of the words are incorrectly spelled. He is instructed to underscore every word that is incorrectly spelled, but the careless candidate becomes interested in the content and forgets to look for spelling, a condition which is typical in many office situations.

C. In this part of the examination the candidate cancels the four letters X, Z, U, and C. This combination of letters is rather difficult to keep in mind and taxes the attention of the candidate.

D. This is a short code learning test in which the systematic worker can profit from attending to the task in hand and thereby soon learning the letter-digit combinations. By doing so he gains time.

E. This is an alphabetizing test in which the candidate writes a list of forty names, placing each name in one of ten spaces and alphabetizing each of the ten groups of names. This test shows not only handwriting but affords a good opportunity for systematizing a simple clerical job since the candidate can choose among many different methods of doing the task.

F. This is also a test in which the candidate can profit by planning the task. He is expected to designate a list of insurance policies in three classes, according to the kind of policy, the date of issue, and the amount. He must keep these three attributes of the policies in mind simultaneously or so arrange his task that he can deal with each attribute sepa-

rately. The method of performing the classification is necessarily chosen by the applicant.

G. The Clerical Examination would not be complete without an arithmetic test. This part of the test contains twelve simple problems in arithmetic, including addition, subtraction, multiplication, fractions, and percentage.

H. The last part of the Clerical Examination is a bona fide general intelligence test and consists in matching ten proverbs with ten other proverbs so that the two proverbs in each pair have the same meaning or moral.

The Clerical Examination is given as an omnibus test with a maximum time limit of 90 minutes for the whole pamphlet. The average time is approximately 40 minutes. The instructions to the examiner are as follows:

"Give the applicant a copy of the Clerical Examination and ask him to do what it tells him to do. Select for him a quiet table where he may work without being disturbed. Record on the cover of the applicant's paper the 'Starting Time.' Tell him to return the blank to you or your assistant when he has finished. When the applicant returns the papers, record his 'Finishing Time.'"

I have found it convenient to eliminate the test proper from the first page of mental test blanks. The test proper is begun after the candidate turns the title page. This feature gives the examiner better control over the time, which is especially important with tests of short duration. On the title page of the Clerical Examination I have arranged a boxed space for a complete record of performance so that the examiner has a definite square in which to record each of the various scores, times, and percentiles. The headings in the boxed space are Finishing Time, Starting Time, Total Time, Speed Rank, Test A, Test B, Test C, Test D, Test E, Test F, Test G, Test H, Accuracy Score, Accuracy Rank, and Combined Rank.

When these pamphlets are filed with the employee's personnel records his performance in the Clerical Examination are easily referred to since it is summarized on the title page. The Accuracy Score is the sum of the scores allotted to each of the ten tests. The Accuracy Rank is the percentile rank of the Accuracy Score. The Speed Rank is the percentile rank of the Total Time.

Statistical Evaluation

In order to ascertain the diagnostic value of the examination it was given to one hundred employees of a large insurance company ranging from minor executives to young office clerks doing routine work. The employees were rated in five classes

according to the grade of office work in which they are employed. In addition to this information the age and schooling of each candidate was ascertained for correlation purposes. The following results are quite interesting.

Grade of office work actually being done by the candidate correlates with:

Accuracy in test	r +.50
Speed in test	r +.42
Schooling	r +.47
Age	r +.35

By multiple correlation the following coefficients have been ascertained between the grade of office work being done by the candidate and:

Accuracy and Speed combined	r +.61
Schooling and Age combined	r +.52
Accuracy, Speed, Schooling	r +.64
Accuracy, Speed, Schooling, Age	r +.67

It is significant, as shown by these correlation coefficients, that speed and accuracy in the Clerical Examination give a more reliable prediction of ability in office work than age and schooling combined.

In evaluating speed and accuracy by the method of multiple correlation it so happens that the two regression coefficients are alike, which means that in the combined score each minute of time is equal in weight to one of the 100 points of accuracy. This fortunate coincidence facilitates the determination of a combined score which represents both speed and accuracy.

Owing to the extensive use of the test it is not advisable to publish the detailed test which would make it available for candidates who might be scheduled to take the examination. Therefore, I have been content to describe the nature of the test and especially the statistical findings. However, I shall gladly send samples of the test to psychologists and other responsible parties who are interested in the investigation.

THE LEARNING CURVE IN TYPEWRITING

By J. Crosby Chapman, Western Reserve University

Object of the Study

The adequate study of improvement in mental functions which concern the educational process must satisfy the following three requirements: (1) the measurement must involve a group of pupils of reasonable size; (2) the study must extend over a prolonged period of time; (3) the investigation must, as far as possible, be incidental to the school work. The measurement of a group is essential if safe general laws are to result; extended practice is necessary because the curve of learning is by no means linear; practise should be under school conditions, otherwise the norms of performance cannot be applied to ordinary school work. Fortunately such a study is possible; typewriting as taught in the various business schools and high schools of commerce furnishes conditions, which while in no way equal to the exactness of laboratory experiments are yet sufficiently under control to be serviceable. Experiments on large groups found in such schools, working for long periods under normal circumstances, satisfy the conditions that have been laid down and give evidence concerning the general nature of changes in the rate of improvement in this complex function.

The present research was undertaken with a double object: (1) to obtain evidence with a view to a systematic study of the psychology of skill from the objective standpoint. (2) To investigate the rate of improvement of the subjects, in this particular school, using this particular method of instruction, in order to establish norms for the comparison of the relative values of different methods of instruction. The latter investigation has interest from the administrative standpoint; in the commercial schools of the country, various methods are employed and it is a matter of some importance to see which method yields the most satisfactory results.

Method of the Study

The general method of the research was to test, each week in the school year, the speed of a mixed class, ages 16-18, in typewriting. The object of the weekly test was explained, each pupil being given a copy of the following:

Information concerning the weekly test.

The object of these tests, which will be given once a week,

is to measure the improvement of each pupil, and the improvement of the school, in speed of typewriting. Each week you will be given a five minute test, consisting of fresh material which is unknown to you. Your object is to type as much of this material as you can in the five minute period, remembering that errors count against you, to the extent of one word off for each error. If you wish to get the maximum score, you will have to decide, as you would in a game, whether it pays you to go quickly and make mistakes, or whether it pays to go slowly and not make mistakes. You alone can decide this. Your record will be carefully filed for reference and will form a picture of your improvement. We need not do more than ask for your hearty coöperation in this experiment, you will be working for your own reputation, and what is more important, for the reputation of the school.

The material used consisted of extracts from Addison's "Essays," which were selected so as to be of approximately equal difficulty. The samples were as a rule slightly modified by omissions and insertions. This was necessary to avoid foreign terms, unfamiliar words, long and intricate quotations, etc. By these modifications a greater degree of uniformity in the weekly extracts was obtained. A short sample is shown, the originals consisted, in all cases, of not less than 350 words.

Sample. "The bridge, said he, is human life, look at it closely. Upon a more careful survey of it, I found that it consisted of seventy entire arches, with several broken arches which, added to those that were entire, made up the number about a hundred. As I was counting the arches the spirit told me that this bridge consisted at first of a thousand arches, but that a great flood swept away the rest and left the bridge in the ruined condition in which I now saw it. But tell me further, said he, what you see on it. I see crowds of people passing over it, said I, and a black cloud hanging on each end of it; as I looked more closely, I saw several of the passengers dropping through the bridge, into the great tide that flowed underneath it, and upon further examination, saw that there were many trap doors that lay concealed in the bridge."

The extract was printed and on a certain day of the week the test was administered to the whole school. Care was taken that the various sections that took the test early in the day did not communicate with the later sections. The following report from each individual taking part in the test was obtained, in addition to the actual extract that was typed in the five minute period: 1. Hours practised since last test,[1] (a) in

[1] The hours reported included the time spent in receiving instruction, as well as the actual time at the keyboard.

school, (b) out of school; 2. gross number of words typed in five minutes; 3. number of errors in words, punctuation and spacing; 4. net score on the basis of one point for each word attempted, less one point for each error. Before the test started very careful inquiries were made to find out whether the subjects had had previous practice in typewriting, if so, for how long, and what method of learning had been used. The scores as recorded in this paper are worked out from the data furnished by report 4, that is upon the total number of words attempted less one word for each error: in no word was more than a single error counted. The experimental errors and individual fluctuations are too great to justify the reduction of the scores to so fine a measure as number of strokes; the time that would be involved in such reduction would yield no adequate return.

At the beginning of this investigation, each pupil in the school who was studying typewriting, whatever his previous amount of practice either in school or out of school, was given the weekly test. This was continued until the group which was the most elementary had completed about 180 hours of practice. Meanwhile the more advanced sections had graduated. In this way the complete curve of learning was obtained for only one group; for the other groups merely a cross section of the curve resulted. The reason for the inclusion of all pupils was twofold, firstly it was hoped that the estimates of the previous amounts of practice of the sections would be sufficiently accurate to justify the compounding of results and comparison of groups. Secondly, if peculiar results were obtained with the most elementary section, during any time in the practice period, it was thought that useful corroborating evidence would be furnished by the other groups. In this present report the results recorded were obtained from the elementary section of pupils who were first given the test when they had practised for a period of 20 hours. They were consistently measured at two to three hour intervals, until they had completed a period of 180 hours practice. The data from the other sections have not been used in this paper, partly because there proved to be considerable doubt about the quantitative accuracy of the estimates of the periods of practice before the tests began, but largely owing to the fact that the results obtained from the group with 20 to 180 hours practice failed to reveal any peculiarity or anomaly which necessitated reference to the results of the other sections.

Reason for selecting 20 hours as the period of minimum practice

Dealing with the section that had just commenced typewriting, it was not feasible to measure improvement from the very early hours, for in the touch method, the attempt is first made to familiarize the learner with particular portions of the keyboard. Under these conditions the power of typing a continuous piece would be no test of improvement; in fact even after ten or fifteen hours there would be a decided tendency if the basis of scoring was one point off for each error to be zero or even negative. In the touch method, unless a certain point is passed, work of any reasonable kind is out of the question. This would not apply to learning by the sight method, where accuracy and steady improvement may be expected. In the touch system certain elementary habit groups have to be formed before the individual can attain a positive score at all; to this extent the scale is inadequate, for a zero score need not represent the zero of typewriting ability. However, any other method of scoring, unless we reduce to strokes correct, would suffer from greater disadvantages than this present method. It is perhaps legitimate to assume that an individual who on the average makes a mistake in each word, has, from the practical standpoint, something which approaches zero ability in the trait.

Final selection of subjects

About thirty-five individuals formed the group on which the first measurement was made after twenty hours of practice. Due to withdrawal, elimination, uncontrolled practice out of school, and lengthy absences only twenty [2] of these thirty-five individuals were consistently tested for the hundred and eighty hours of the practice period. If we consider the beginners in this section as a random sampling of the human material that commences the study of typewriting in commercial high schools, it is perhaps reasonable to suppose that the twenty individuals who completed the major part of the course form a slightly selected group. There are however certain counterbalancing factors. In most cases the elimination due to inefficiency, which is small, is not based primarily on lack of typewriting ability; in fact towards the end the withdrawals might well be those who, because of superior attainments in

[2] As a matter of fact nineteen, for the record of subject P ends at 110 hours; this record was included by mistake, but it has been retained in order to avoid recalculation.

stenography and shorthand, were commercially acceptable for early employment. The financial and social factors in the home—a large cause of the elimination—would be independent of typewriting ability. We may consider therefore, without making any appreciable error that the twenty pupils who completed the major part of the course were not selected upon any basis which would cause the results to lose any material value. The conclusions may be taken as typical of the normal rates of improvement for students of high school age and attainments, who are taught under the conditions prevailing in this school.

Tables and curves of improvement of the twenty subjects over period of practice from 20—180 hours

In order that these results may be used for more general purposes than the specific objects of this present study, it seems advisable to give in their complete form the material on which is based the curves of improvement for each individual. This is found in Table I. No record of errors is reported in this study, the two measurements which define any weekly test record are: 1. the total number of hours of practice since the last test taken; 2. the score on the basis of the number of words attempted in five minutes less the number of words in which errors were made, with one word subtracted for a spacing or punctuation error. If the reader is interested in the relationship between speed and accuracy a large number of typical results can be obtained from an earlier paper [3] which reported the positive acceleration in improvement which is found in many cases in the early part of the practice period. In this paper will be found a discussion of other studies which have investigated the learning curve in typewriting. For this reason any such discussion has been omitted from this paper.

[3] Chapman & Hills. *Journal of Experimental Psychology*, Vol. I, No. 6, pp. 494-507.

TABLE I

SCORE OF SUBJECTS (FIVE MINUTE PERIOD)

Hours Practised	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
20	38			34	27		46					30	41			59				
22	45	41		45	37						28				29					
24		52	55				55			28		30	53			61				
26	58			48	49	50		56	44		30	50	53	93	40		89	38	38	55
28		77	95		44	59		73	90	42	61	50		142		92	75	51	46	68
30	57	70	90	57	52		76				55	57			45	107				
32	76	88		62	59	64		87	88	51	82		48	103	54	106	84	58	59	88
34	92		101	64		72		86	105	70		58	64					66	74	97
36	144	82		106	62		58			82	80	73		154	66	123	92			
38		111	95		54	80	74	107	118		106		69		68		106	83	71	106
40	135			88						80		60	102			149				
42		86	131				78			109	82			180	82					
44	139			81	80	116	86	138	145			67	79		71	130	123	80	98	148
46	169	125	118	111	64			122	121	96	95	98		156						
48						85	62								72	144		91	67	
50	153	143		103	67					113	112	84	74	175	105		116			142
52	145		133	112		96	91	132	128		107		94			164		83	90	
54			150		80				151	142		126		162	81	150	136			
56	154	190		120	80	121	101	127		114	135	110	88					95	105	
58	181	205	128			115	92		154		150			186	115	197	128			226
60				122	89			173		156		127			162			130	94	
62	195	193	155	110	89	127	118		173		140	150		235		198	150	122	125	
64	185							226		145	135		116			186		146		
66			200	133	91	141	148		238			145		194	149		207		158	183
68	198	199		199	110		131			170	138	161				192		144		
70	197				157						147		134	186	138	198		143		
72				143		159	152	150		166	222	181					204		137	206

TABLE I—*Continued*

SCORE OF SUBJECTS (FIVE MINUTE PERIOD)

Hours Practised	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
74	205	195	197	166	125	....	142	179	....	....	160	186	....	231	153	177	....	153	....	....
76	....	191	....	....	....	136	158	....	180	167	....	202	134	....	131	191	188	166	147	241
78	229	....	....	186	145	....	....	200	182	169	185	....	....	....	....	191	185	....	....	209
80	267	....	....	177	122	151	158	....	....	....	180	207	....	201	158	....	....	159	135	....
82	....	215	221	....	....	148	168	201	212	....	223	192	123	209	....	216	203	195	....	225
84	193	....	....	....	156	....	....	....	....	....	....	....	....	....	145	205	....	....	134	....
86	....	204	....	....	....	157	190	178	223	182	....	....	....	207	....	219	200	222	174	227
88	....	....	217	167	....	....	202	....	228	206	214	193	124	225	193	....	....	180	....	235
90	230	215	....	174	137	131	230	220	....	....	214	....	....	....	165	....	206	....	193	....
92	223	....	....	....	....	....	....	....	236	235	....	197	....	230	....	211	....	....	....	....
94	....	209	214	....	153	160	....	238	....	207	192	201	135	....	....	....	216	....	186	221
96	....	218	....	....	....	....	212	....	....	....	239	....	....	....	200	218	....	....	....	....
98	234	230	....	185	148	176	....	....	....	....	....	205	158	....	....	....	239	183	158	....
100	250	....	225	168	164	....	233	....	199	202	214	222	....	201	....	210	....	180	....	....
102	....	....	....	....	....	161	200	....	....	....	....	....	....	....	198	246	206	....	....	281
104	256	....	....	187	185	....	....	254	....	202	215	229	156	....	....	242	....	....	....	....
106	....	230	198	....	....	....	261	....	226	....	....	....	....	....	234	....	....	....	222	....
108	....	....	....	....	169	172	274	....	....	222	205	....	....	220	224	....	....	199	....	....
110	248	....	....	196	....	....	....	233	275	....	....	....	160	274	....	....	....	209	196	....
112	....	....	213	....	....	....	240	....	248	206	....	....	....	....	215	....	233	....	....	242
114	206	....	....	187	191	....	....	244	....	....	207	207	....	297	....	....	....	199	209	....
116	....	261	....	....	....	209	....	228	247	....	....	....	187	....	....	....	232	....	....	284
118	218	....	193	179	217	....	235	....	....	226	198	....	....	254	208	....	....	....	....	....
120	....	....	....	....	....	180	216	217	....	....	....	205	....	....	....	....	231	209	197	....
122	....	....	....	....	208	....	....	....	206	....	226	....	....	251	197	....	....	....	....	244
124	250	....	215	206	....	184	....	221	....	194	....	189	164	....	....	....	272	187	181	....
126	....	231	....	....	....	....	227	237	196	....	....	....	....	....	....	....	....	....	....	232
128	259	....	....	226	177	180	....	....	....	180	228	....	....	229	182	....	....	178	....	....
130	....	....	240	....	....	....	252	....	226	....	....	234	....	....	....	....	230	....	206	....

TABLE I—*Concluded*

SCORE OF SUBJECTS (FIVE MINUTE PERIOD)

Hours Practised	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
132	....	....	....	260	204	159	....	238	....	....	263	....	....	208	220	....	....	....	....	261
134	....	....	....	....	....	....	....	....	....	211	263	230	....	....	....	....	213	199	209	....
136	245	215	284	211	....	165	261	313	226	....	....	....	139	....	216	....	....	....	....	277
138	....	....	....	....	....	....	....	205	....	223	....	225	....	227	....	....	....	199	226	....
140	....	....	....	....	....	189	287	....	298	....	....	201	....	....	....	....	243	....	....	....
142	....	....	252	....	....	....	251	....	228	221	....	....	....	237	229	....	....	220	....	....
144	....	....	....	238	245	....	....	....	....	226	215	....	142	....	233	....	253	....	236	272
146	284	238	231	....	....	180	....	....	....	....	....	....	....	249	....	....	....	224	....	....
148	238	....	....	205	212	....	....	....	....	....	238	....	163	....	....	....	....	....	230	....
150	....	....	....	....	....	186	283	247	....	....	231	....	....	261	....	....	321	....	....	....
152	257	....	....	215	....	186	....	....	....	....	....	206	....	....	....	....	278	....	....	....
154	246	247	....	207	....	....	....	....	245	....	236	....	176	....	....	....	....	....	....	....
156	....	....	218	....	224	....	....	....	....	223	....	....	....	....	207	....	....	....	....	....
158	269	....	....	249	....	....	256	304	....	....	266	228	166	....	....	....	....	232	....	235
160	....	....	....	....	220	....	298	....	....	....	....	219	....	....	....	....	....	....	233	....
162	231	....	223	230	223	222	348	....	292	....	244	....	....	263	273	....	....	....	....	252
164	242	267	....	227	....	....	301	233	....	254	275	210	154	....	....	....	251	....	....	275
166	248	288	248	208	223	207	....	....	242	....	220	222	....	....	....	....	....	265	....	....
168	....	....	....	....	262	202	286	245	....	....	....	....	177	....	....	....	....	....	280	....
170	263	....	....	241	....	220	....	211	255	198	220	....	....	301	....	....	....	238	....	....
172	....	280	248	....	238	....	293	....	262	....	....	....	180	237	....	....	264	238	218	....
174	....	....	319	....	....	243	....	....	....	238	....	....	....	....	231	....	234	....	....	....
176	....	258	256	....	248	....	268	....	....	....	....	204	....	269	233	....	....	232	248	....
178	....	....	....	....	216	218	....	....	251	....	....	....	199	261	....	....	302	....	....	....
180	....	264	....	....	....	206	276	....	....	206	....	....	204	....	....	....	....	....	....	....
182	....	....	....	....	251	....	....	....	....	....	....	....	....	....	....	....	285	214	233	....
184	....	280	....	....	....	205	....	....	....	....	....	....	....	....	....	....	....	....	....	....
186	....	....	282	....	....	223	....	....	....	....	....	....	....	....	....	....	252	....	....	....
188	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
190	....	292	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

From this table the curves of improvement of eight typical individuals have been drawn

SUBJECT B

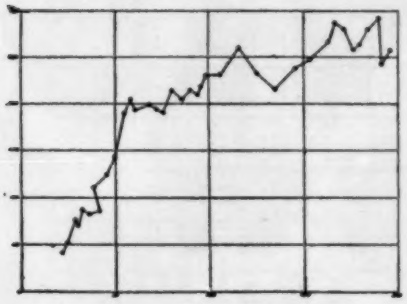


DIAGRAM 1

SUBJECT E

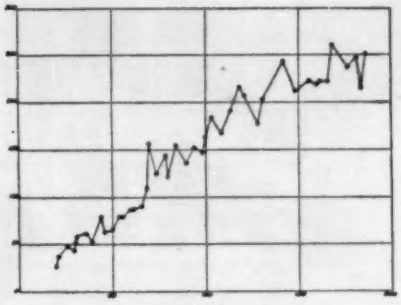


DIAGRAM 2

SUBJECT F

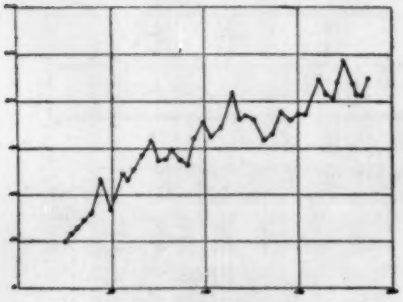


DIAGRAM 3

SUBJECT G

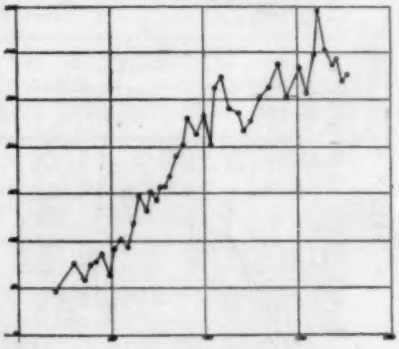


DIAGRAM 4

SUBJECT J

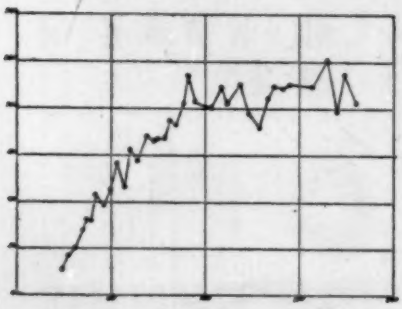


DIAGRAM 5

SUBJECT L

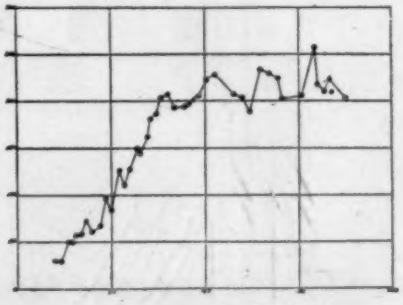


DIAGRAM 6

SUBJECT M

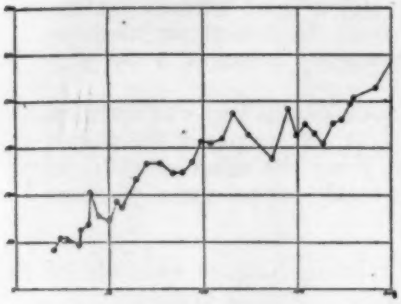


DIAGRAM 7

SUBJECT R

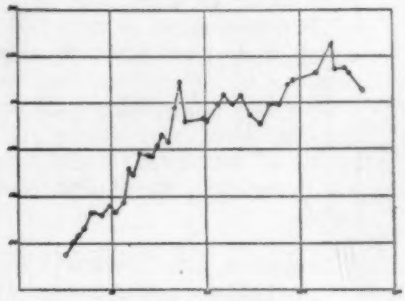


DIAGRAM 8

Care must be used before making generalisations on the basis of one or two points which form part of any particular curve. Each point on the curve is the result obtained from one test period of five minutes. The score of this period is subject to the fluctuation always found under such conditions, due to complex internal factors of interest, fatigue, interference, excitement, adaptation, etc. In addition any period which is represented by an erratic point may have been subject to the errors arising from 1. subject not stopping at signal given; 2. a copy which for some reason or another was much more difficult or much more straightforward for a particular subject than the average run of copy. This warning is given to prevent those who may work over these results from pressing any single values into the solution of problems, where the error of observation of the value may be too great. A combination of points however may be taken as a fairly reliable guide for such work.

An analysis of the shapes of the curves reveals among other things the following facts:

1. Individuals, reaching after the same period of practice the same degree of skill, do not by any means learn in the same manner;

2. there is no fundamental or typical curve to which all individual curves approximate;

3. short plateaus are present in the curve of many individuals, these plateaus are probably genuine, but they do not occur at fixed places which are the same for all individuals;

4. some individuals show distinct positive acceleration in improvement in the period from 20—60 hours;

5. some subjects are comparatively erratic in their variations from week to week, due to a complexity of internal factors, while others seem to vary little from the rate of performance which their own curve of improvement indicates is the true rate.

It is impossible within the compass of this paper to do more than mention these salient points, in a later paper the author hopes, if interesting facts result from the other material in his possession, to publish more evidence on some of these points.

Distribution table showing the relation between amounts of practice and scores at specified intervals of time

In the contingency table (table II), there are shown the scores made by the twenty subjects distributed according to the various practice periods. It should be noted that the twenty-five hour period includes twenty to twenty-nine hours of practice, while a score of twenty-five represents any value between twenty and twenty-nine.

A slight explanation is needed with reference to the cases included under any particular practice period; it does not follow that in each period the same individual will be included an equal number of times. Owing to practice out of school and to absences all of which were recorded, it may happen that whereas in the period 20-29 hours, A has five scores, during the period 30-39 A happened to have only four scores included. This factor however neutralizes itself and the averages obtained are almost identical with those that would result if within each period an equal number of scores for each individual had happened to be present.

Tables and curves showing scores at various intervals of practice

On the basis of distribution Table (II) the following scores for each ten hours of practice are shown in Table III.

(1) Average of the two lowest scores, (2) the 25 per cent point (counting from lowest individual), (3) median score, (4) the 75 per cent point, (5) average of the two highest scores. This tabulated material is exhibited graphically in diagram 9. In table (IV) the average score for each ten hours of practice is given, and the composite result shown in diagram 10.

The three salient features of the curve of improvement (diagram 10) are: (1) The initial linear relationship which extends over a period of 75 hours, (2) the abrupt turning point

TABLE II

WORDS WRITTEN CORRECTLY IN FIVE MINUTES

Hours Practised	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	305	315	325	335	345	355
25	4	8	12	14	3	4	1	3	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	2	13	9	9	12	5	10	2	1	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	5	4	10	6	2	3	4	4	4	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
55	...	...	...	...	1	1	6	6	5	8	7	4	4	7	2	1	2	2	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
65	...	...	...	...	...	...	2	2	...	4	5	5	9	5	2	3	3	7	2	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...
75	...	...	...	...	...	...	...	...	...	...	1	6	6	7	6	2	9	7	6	...	2	1	1	...	...	...	...	...	...	...	...	...	...	...
85	...	...	...	...	...	...	...	...	...	...	3	2	2	6	2	3	3	6	11	6	8	1	...	...	1	...	...	...	...	...	...	...	...	...
95	...	...	...	...	...	...	...	...	...	...	...	3	1	3	1	2	4	3	6	8	3	10	...	...	...	...	...	...	...	...	...	...	...	...
105	...	...	...	...	...	...	...	...	...	...	...	...	...	1	4	1	3	4	6	8	3	7	4	2	2	1	1	...	...	...	...	...	...	...
115	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	2	6	8	4	2	6	4	2	1	2	1	1	1	...	...	...	...	...
125	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	8	4	5	3	6	4	2	2	...	1	...	...	...	...	...	...	...	...
135	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2	...	...	2	5	5	4	7	2	2	4	1	1	...	...	1	...	...	...	...
145	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	2	...	2	2	9	6	2	3	...	...	2	1	...	...	1	...	...	...
155	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	2	...	3	2	4	4	5	2	2	1	1	...	1	...	1	...	...	...
165	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	3	2	8	4	6	3	4	3	3	2	1	...	...	...	1	...
175	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	1	4	2	9	5	4	6	...	1	1	2	1	...	...	...	...

at approximately 90 hours of practice, (3) the return to the second linear curve which extends from 90 hours to at least 180 hours of practice.

The main questions which arise from the abrupt turning point at approximately 90 hours are:

(1) Is this characteristic of the particular method of teaching (the Curry method)?

(2) Is it perhaps only true of the work of this one school?

(3) Is the school justified in spending the period from 90-180 hours for such small returns?

TABLE III

TABLE SHOWING SCORES AT VARIOUS INTERVALS DURING THE PRACTICE PERIOD

Hours practised	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165	175
Average of two lowest scores	28	47	61	72	89	128	123	133	159	170	172	152	153	171	166	189
First quantile	40	61	82	102	130	152	165	183	193	200	189	198	221	215	225	230
Median	51	80	97	120	149	175	200	208	217	215	208	210	230	235	233	242
Second quantile	59	98	129	153	183	196	215	227	235	243	230	250	250	255	270	262
Average of two highest scores	118	149	175	216	237	236	251	239	278	291	263	299	313	313	325	329
No. of cases	50	65	48	58	52	54	54	44	41	40	38	37	34	30	42	39

DIAGRAM 9

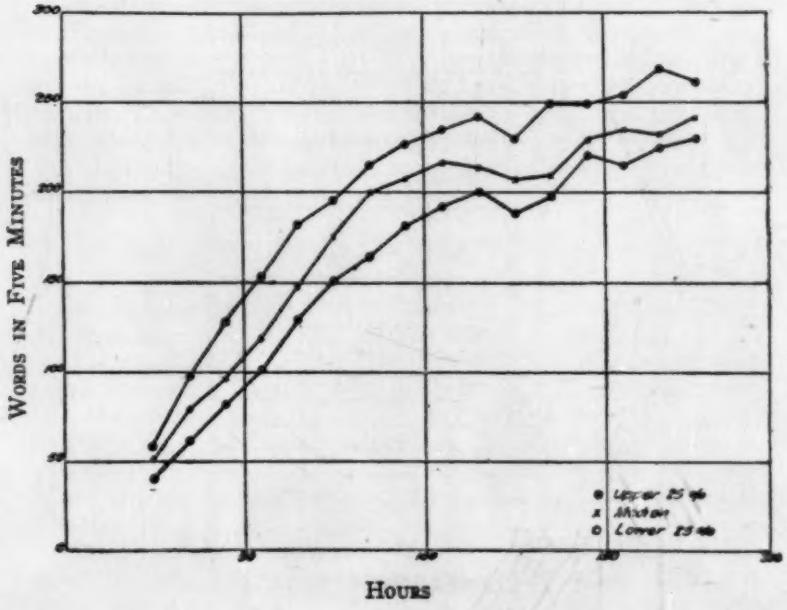
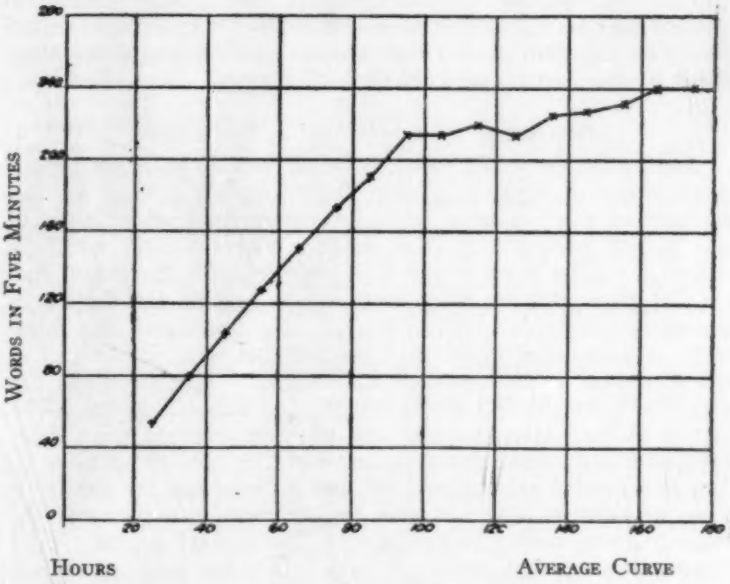


TABLE IV

AVERAGE SCORE AT VARIOUS INTERVALS OF PRACTICE

Hours practice..	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165	175
Score, five minute period....	54	81	105	128	151	174	191	216	215	222	216	228	230	235	246	245

DIAGRAM 10



HOURS AVERAGE CURVE

Only one point need be made; as far as the writer can judge, there is nothing in the method used in this school, or change in type of instruction or aim of work, at ninety hours to suggest any such rapid alteration in the slope of learning curve. Most of the problems raised will only be settled by the publication of studies on similar lines which investigate improvement in typewriting, where other methods of instruction are employed.

While from the standpoint of diagnosis any equation of a curve with such an abrupt point of turning is worthless, for mere convenience the following equations are given, which have practical value for reference but no theoretical significance.

For period of practice, 20-90 hours $Y=2.3X$

For period of practice, 90-180 hours Y=180+.4X

Where X is expressed in hours and Y is the average number of words typed in five minutes with one word deducted for each error. The incidental uses which can be made of the detailed results given in the tables are numerous, these have been left for reasons of space and because of the particular interest of the writer. However the examination of a fairly large group in a complex mental function over 160 hours of practice has yielded objective results which show how dangerous may be the attempts to construct a psychology of skill based on the short period examination of the rates of improvement of one or two subjects.

Forecasting of future skill in typewriting

In view of the work, which is being done in vocational guidance, which attempts to predict future ability in some specific occupation after training, it is interesting to analyze some of the results obtained in this paper. The question which is asked is: "To what extent is it possible from the initial success of an individual in typewriting to predict the degree of success after prolonged training?" To investigate this question the average score of each subject has been determined at three periods in the practice experiment. These periods are (a) 20-35 hours; (b) 76-91 hours; (c) 136-151 hours. The scores of each subject over each of these periods were averaged and they are shown together with the ranking in table V. The first period was chosen because it furnishes the first possible moment at which it was fair to make comparisons for reasons given earlier in the paper. The second period (76-91 hours) was selected because it falls before the point of change in the curve, which appears to take place at 90 hours. The third period was selected because it gives us some approximations to the final standing of the individual.

TABLE V

AVERAGE SCORES OF EACH INDIVIDUAL AT THREE POINTS IN THE PRACTICE PERIOD

Cross section of practice in hours	Average Score of Subject																		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	R	S	T
20–35	64	65	80	52	45	61	60	76	82	48	51	46	52	113	42	83	53	54	77
76–91	230	206	219	176	140	146	184	200	205	182	203	198	127	211	162	196	184	157	227
136–151	256	227	256	218	228	180	271	255	251	223	228	213	148	244	226	272	214	231	274
Rank order 20–35 hrs.	8	7	4	13	18	9	10	6	3	16	15	17	13	1	19	2	12	11	5
Rank order 76–91 hrs.	1	5	3	14	18	17	11.5	8	6	13	7	9	19	4	15	10	11.5	16	2
Rank order 136–151 hrs.	4.5	12	4.5	15	10.5	18	3	6	7	14	10.5	17	19	8	13	2	16	9	1

The following points should be noted: 1. No test was made until twenty hours of practice in the function; 2. The test itself was an average of three to five measurements over a period of sixteen hours; 3. The test was in identically the same function as that in which later skill was desired.

The correlations between initial ability, intermediate ability, and final ability are shown below, using the method of rank square deviations:

Initial ability with final ability	.65
Initial ability with intermediate ability	.66
Intermediate ability with final ability	.66

These coefficients are reasonably high from the statistical point of view; that is a school, wishing to choose fifty pupils from a hundred who had practised 20 hours, might well consult the records at the end of this period of time. But if justice to the individual rather than a "statistical justice" to the group is necessary, it can readily be seen that the use of the initial ability as an indication of future skill would be very precarious. It is more likely that a mental test of fifteen minutes would give a better selection for the purpose of even the narrow function of typewriting and certainly for the whole work of the school.

The ordinary skill prediction test, when used for the purpose of vocational guidance, takes but a few minutes to administer, is often a matter of chance initial adaptation, and is usually in a very different function from that in which future skill is to be predicted. Tests of this type must be thoroughly tried out before their usefulness is admitted. For in contrast to the ordinary skill forecasting test, it must be remembered that the prediction test here described was a very lengthy one, after considerable adaptation, and in precisely the same function as that in which prediction was to be made. The low assurance value from the standpoint of individual guidance is revealed by the correlation coefficients. Vocational tests are not usually given for purposes of group selection but primarily for purposes of individual guidance. Therefore the distinction between "statistical justice" and "individual justice" becomes of great moment. Many who quote high correlation coefficients seem to forget this important consideration. To the man who is seriously wounded in action, the fact that he had a 99 per cent chance of safety is small comfort, but the same factor is a perfectly legitimate basis at headquarters for the calculation of replacements. The school must use every means in its power especially in the vital problem of vocational

guidance, to guard the rights of the individual while it adopts the necessary selections which are based on statistical averages.

Summary

The learning curve in typewriting has been studied over a period of practice extending from 20 to 180 hours. From a large amount of data, twenty full individual records have been selected for presentation. The following are some of the more salient results: 1. There is no fundamental typical curve of improvement; 2. prolonged plateaus are notably absent,[4] most of the subjects exhibit short plateaus which are probably genuine; 3. some subjects show positive acceleration in improvement in the period 20 to 60 hours; 4. subjects vary greatly in their erratic variations from week to week.

The norms of achievement at each ten hour period are given in six forms: a. the lowest point; b. the lower quartile point; c. median point; d average point; e. upper quartile point; the highest point.

The composite curve of improvement shows a most abrupt change of direction at 90 hours, from having an initial equation, (Y=2.3X) to a form, (Y=180+.4X).

The early results have been analyzed from the standpoint of their value in the prediction of future typewriting skill.

This study, which involved careful work each week for nearly two years, could never have been carried out without the continuous help of Mr. James S. Curry. Mr. Curry is the inventor of the method of instruction in typewriting which goes by his name. The subjects of this study were therefore under the supervision of the originator of the method. In expressing my obligation, I wish to join with the name of Mr. Curry that of Miss M. E. Hills, with whom this work was jointly started but whose absence from the city prevented its joint completion.

[4] Unless, as evidence seems to suggest, the period, from 95—180 hours, is considered as a long plateau, from which the subject, with great effort, can rise.

NATIONAL CONFERENCE ON AMERICANIZATION IN INDUSTRIES[1]

By Chester S. Carney

Introduction

About 200 persons assembled at the Atlantic Hotel, Nantasket Beach, Mass., June 23 and 24, to discuss the part which industry should take in the program of Americanization.

This meeting was an outgrowth of the Conference of Americanization Workers held in Washington in May under the auspices of the United States Department of the Interior. About three-quarters of the delegates represented industrial establishments either directly or through associations like the Associated Industries of Massachusetts and the National Manufacturers Association. The remainder came from such organizations as the Y. M. C. A., City and State Boards of Education, City Americanization Committees, and War Camp Community Service organizations.

This was a most happy combination of seers and doers, resulting in a series of inspirational addresses on what Americanization should accomplish, supplemented by suggestive discussions on the practical details of "how to do it."

What Is Americanization?

The keynote of the conference was the emphatic assertion that Americanization is a community activity, more organic than mechanical in its nature, that it means more than mere naturalization of foreigners. It is even bigger than an educational program of instruction in English, history, and civil government. It means the assimilation of our foreign born population into all phases of our national life, involving a change in the attitude on the part of the native American, as well as a development of the ideals of the foreigner. "You cannot become an American overnight, by an initiation proess, the way you become a Mason or an Elk." "It is not like

[1] This report is reproduced here by kind permission of Scovell, Wellington & Company, Boston, New York, Chicago, Cleveland and Springfield, Mass., Industrial Engineers and Scientific Management with whom the author is associated.

changing a suit of clothes." "We must be more concerned with the quality of citizenship rather than with the quantity."

It was repeatedly pointed out that each racial group has its contribution to make toward our mutual welfare; that we have much to learn from the "stranger within our gates;" that no line can be drawn between Americans and immigrants: we are *all immigrants* originally; and that we must never allow ourselves to indulge in the "I-am-holier-than-thou" attitude of raising the foreigner up to our level, but rather that we have a great destiny to work out which we cannot accomplish without his help. We want to work *with* him, *not* for him, realizing that he is an asset, not a liability.

Should Attendance at English Classes Be Compulsory?

The problem of how to retain class attendance drew the fire from all the batteries. Representatives of several large plants argued at some length for compulsion. The analogy of compulsory attendance at public school was drawn. It was asserted that some workers did not know what was good for them, and that those who would not attend English classes were undesirable employees. "The voluntary attendance plan had been tried, and had failed. Attendance started at 200 and dropped to 20."

Opposing the benevolent paternalists were the champions of democracy, proclaiming the essential sanity and good intentions of the majority of mankind; that it was rare, when the matter had been properly presented to the men, that anyone refused to attend class; and that the few unwilling individuals would finally yield to the pressure of public opinion without necessitating the use of the big stick. This argument prevailed to such an extent that a vote of 100 to 8 was taken in favor of voluntary attendance. That this was not wholly indicative of the sentiment of the entire conference was evident in the open forum Tuesday afternoon, when the compulsionists were reinforced by late arrivals and the democrats were weakened by the loss of their leading orator. But a vote was not taken, and the majority still seemed opposed to compulsion. During the discussion a very able mediator distinguished clearly between the men who are successful because of their powerful personality, in spite of the fact that the theories they hold are false, and men whose theories may be fine but who fail to "get them across."

Should Employees Be Paid for Time Spent in Class Attendance?

Few arguments were raised on either side of the question. Most seemed to agree that when classes were held during working hours the hourly rate should be paid, and when classes were held after working hours no payment should be made. A census of the delegates showed 18 plants holding classes during working hours, 36 plants holding classes after working hours, and 6 dividing the class period between employee's and employer's time. Three plants actually charged an enrollment fee, which in two cases was returnable at the end of the course.

What Relation Should Exist Between the Teachers of English to Non-English Speaking Workers and the Public School Authorities?

One of the two most discussed issues raised at the convention was the extent to which the work of teaching English to non-English speaking workers should be turned over to the public school authorities.

On the one side were those who had in mind the general principle that teaching was the function of the public schools, and production the function of industry; that therefore all educational work should be headed up and supervised by the public school authorities.

On the opposite side were those who had found particular instances where the public schools had not lived up to their civic obligation, so that the work would have been neglected had not philanthropic or industrial organizations come to the rescue.

Between these two camps there was no essential disagreement. It was practically the unanimous opinion that cooperation with the public schools was desirable. All admitted that in some communities the public school had not been ready to assume the responsibility, and sometimes had failed to accomplish the work it had undertaken. But the faults, it was argued, were faults of a locality, and not of a principle. As one opportunist put it: "We all know that 'the cathedrals are built of the stones of the country,' that conditions in one locality make one plan a success, while the same plan would fail utterly under the conditions which obtain in another locality. But we must agree that as a general rule, supervision by the public school is desirable."

Practical Hints On How To Do It

In the discussion of practical details some valuable suggestions were brought out.

From several sources came descriptions of graduation exercises which help the new citizen to realize the significance of his enfranchisement; that his "Second Papers" are in a different class from his vaccination certificate, with which they were frequently confused by applicants for war work in a certain plant! In one place the graduates were addressed by the Mayor, the Governor, and a representative of the Federal Government, after which they were personally introduced to these officials.

In another a pageant was held, where the "Goddess" of the city welcomed each racial group into her family expressing her appreciation of the gifts which each group contributed, and maidens in folk costumes responded, laying at her feet symbols of these gifts.

The necessity of reaching the foreigner in his own language was often stated. One of the most practical papers, by a man who has organized Americanization work in several plants, presented the following program:

1. *General propaganda*—through foreign-language papers, pay-envelope stuffers, bulletins and pamphlets describing the plan in detail printed in the native languages of the foreigners.
2. *Group mass meetings,* addressed by interpreters who are prominent in the national group.
3. *Personal interview* by a representative of the management, a high grade man who will explain that the aim is to help the worker to find his way through the difficulties of red tape attached to the process of naturalization.
4. *Training for citizenship.* The laboratory, or "direct" method was advocated; the first seven of ten lessons to be devoted to what the government does for the individual, the last three on what the individual does for the government. The teacher must know the difficulties which confront the applicant for citizenship, especially the court procedure. One teacher conducts a mock-court as a final lesson of the course, showing just what is to be expected.
5. Arrange for *filing papers* in court. The foreman is a better witness than the saloon keeper.
6. Welcome to citizenship should be a social event in which plant and civic officials should participate.

In teaching English, four grades are useful:

I. Illiterates in their native language.

II. Those who cannot speak English, but can read and write another language.

III. Those who speak English, but can read and write it very little.

IV. Those who can read and write English. These are ready for citizenship course.

One speaker pointed out that instruction in English was the first step in safety work.

Another stated that classes in English were held for convalescents in the hospital where the work helped to fill their idle time.

In one plant where the company was conducting classes twice a week during working hours the students of their own accord requested a third session to be held on their own time.

A large rubber company held "Recognition" exercises Sunday afternoon, which 1,200 people attended, and at which 400 students received diplomas in recognition of 75 or 150 hours' attendance at classes.

In addition to the class work, all recreation activities and the work of the visiting nurse were declared to be valuable points of contact by which Americanization can be forwarded.

There was repeated emphasis upon the importance of the foreman's active cooperation in all efforts for Americanization, particularly in following up absentees.

One plant has accomplished fine work in cooperation with the International Institute of the Y. W. C. A. Rooms were rented in the district where the foreigners lived, and classes were conducted in English and domestic science for the wives and children of the workers.

In another plant dances are held frequently, with folk dances taught by foreigners and American dances by the native born.

An interesting suggestion was that of modifying the 8% alien income tax to apply to all who have not taken out first papers, and 4% to all who are not citizens, the proceeds to be used for Americanization work.

A representative of the State Board of Education outlined a plan by which instructors were to be chosen from within the works, and trained to teach English to adult immigrants in a class conducted by the board of education. He pointed out the advantage of such teachers to the plant in promoting

esprit de corps, and asserted that teaching English to adult foreigners was a special problem in itself.

One speaker asserted that Bolshevism was a product created in New York by our failure properly to Americanize our immigrants.

Addresses On Other Subjects

In addition to the discussions of Americanization, several worth-while addresses were made by men who have been doing conspicuous work during the war. Mr. Howard Coonley, president of the Walworth Company and formerly vice-president of the Emergency Fleet Corporation, told of their experiences in handling disagreements between management and men, which were settled in conferences between seven representatives of the men and seven representatives of the management.

He expects great volume of business this fall, with accompanying shortage of labor.

Mr. W. Graydon Stetson spoke on the program for thrift and saving, which will probably be continued for at least five years more, he believes.

Mr. B. Preston Clark, of the Plymouth Cordage Co., spoke most interestingly of the two great movements resulting from the war: the increasing power of the people, and the increasing value of leadership. He quoted the Arabian proverb,—"The camel-driver has his thoughts, and so has the camel, too," and asserted that we need more than ever before to consider the thoughts of the "camel." The futility of theorizing without intimate sympathetic knowledge of the conditions he illustrated by quoting:

> "The toad beneath the harrow knows
> Exactly where each tooth-print goes.
> The butterfly flitting by the road
> Preaches contentment to the toad."

He is hopeful of an ultimate solution of the Americanization problem, because this conference has shown very clearly that we possess the two essential qualities—imagination and humanity.

Mr. Frederic C. Hood, president of the Associated Industries of Massachusetts, in his opening address declared that management has two branches, one the management of materials—which is applied science—and the other the management of men—which is applied religion. He called attention to the need of a higher grade of leadership, and asked whether managers were prepared to supply this leadership, or must the workers look elsewhere. He asserted that 75% of the cases which came before the War Labor Board came from

industries suffering under absentee management. He emphasized the strategic importance of the teacher in the Americanization program, and advocated the payment of better salaries. He urged all to read:

"*Back to the Republic.*" Harry F. Atwood (Laird & Lee).

"*Money and Prices.*" J. Lawrence Laughlin (Chas. Scribners Sons).

An able paper written by Mr. Alvan McCauley, president of the Packard Motor Company (who could not be present), pointed out the need for greater coordination and cooperation among the various bureaus of government and the volunteer organizations concerned with Americanization. He declared that "there is a confusion of tongues" and much working at cross purposes.

APPENDIX A

Resolutions Adopted by the Conference

"We, the representatives of the educational forces of industry, recognize that industry has a definite part with the other forces of the community in initiating and organizing Americanization work; therefore,

"*Resolved,* That instruction in English for non-English speaking people should be carried on in cooperation with the public educational forces, provided such forces are prepared and will assume responsibility. We pledge our aid in our respective communities to bring about this cooperation.

"*Resolved,* That non-English speaking employees attending English classes in industry should attend such classes voluntarily and without compensation.

"*Resolved,* That every industry employing non-English speaking people formulate a definite policy regarding Americanization work, and that such work can best be done when a responsible person is charged with its direction.

"*Resolved,* That we, as a representative group of industries, unanimously disapprove making naturalization a condition of employment, and recommend that every community establish at least one school for citizenship."

APPENDIX B

List of Pamphlets on Americanization

A number of pamphlets were exhibited, which would be suggestive to any plant planning to install classes in English or citizenship. Such a plant will receive help from the organizations referred to below.

City History Club of New York, 105 West 40th Street, N. Y., have a program using the laboratory method.

Associated Industries of Massachusetts, 1034 Kimball Bldg., Boston Mass. "Americanization in Industry—How to Organize English and Citizenship Classes," by George F. Quimby. 31 pp.

Americanization Bureau, Pennsylvania Council of National Defense. George W. Pepper, chairman, Philadelphia. "Americanization in Pennsylvania." 40 pp.

Americanization Committee, City of Duluth, Minnesota. "How to Become an American." 24 pp. 15 cents. (Printed also in Italian.)

Y. M. C. A., Lawrence, Mass. "The Citizen: First Lessons in United States History for Immigrant Men." 31 pp. 25 cents.

Charles H. Paull, Harvard University, Cambridge, Mass. "Americanization: A discussion of present conditions, with recommendations for the teaching of Non-Americans." (A report submitted to the Solvay Process Company.) 27 pp.

Federal Board of Vocational Education. "Advanced Course in English for Foreign-born Men." 31 pp. 1919.

Raymond F. Crist, Deputy Commissioner of Naturalization, Washington, D. C. "Students' Textbook: Standard Course of Instruction for the Preparation of the Candidate for the Responsibilities of Citizenship." 132 pp. 1918.

Department of University Extension, Massachusetts State Board of Education. "Federal-State Program for Immigrant Education." 20 pp. January, 1919. "English for American Citizenship." 12 pp. July, 1918.

Old Colony Trust Company, 17 Court Street, Boston, Mass. "Getting Together," Extracts from addresses on Bolshevism, by A. J. Peters, N. B. Endicott, and W. H. Taft, May 20, 1919. 18 pp.

Cleveland Board of Education. "Lessons in American Citizenship." Raymond Moley. 65 pp. 1918.

Edwin A. Rumbull, General Secretary Civic Education Association, Buffalo, N. Y. "New Citizens' Handbook." 34 pp. (Printed in Polish, Italian, Hungarian, etc.)

International Committee of Y. M. C. A. has prepared extensive course in English for foreigners.

The General Electric Company has prepared moving-picture film on Americanization, which may be borrowed by those interested, on application to Mr. M. R. Griffeth, 84 State Street, Boston.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF INDIANA UNIVERSITY

I. A COMPARISON OF COLORED AND WHITE CHILDREN BY MEANS OF A GROUP SCALE OF INTELLIGENCE.

By S. L. Pressey and G. F. Teter.

I. *Problem and Materials.* Colored children show a greater school retardation, less acceleration, and average older for a given grade, than do white children.[1] There is some evidence to show that, grade for grade, they do poorer school work.[2] Negro children give ratings, when tested by the Binet and Point Scales, averaging below white children.[3] Measurements of special abilities have shown the colored children to do relatively well in tests of the more simple processes (as cancellation, rote memory) and most poorly with tests of the more complex abilities[4] (as opposites, analogies, sentence completion). There is some evidence that colored children have more active imaginations and more ready associations of an uncontrolled type than do white children.

There would thus appear to be the beginnings of an exact science of racial differences, as shown by school children. But—as has been well pointed out recently[5]—the proper evalu-

[1] See for instance, Perring, L. F. A Study of Comparative Retardation, *Psychological Clinic*, Vol. 9, 1915, pp. 87-93; Mayo, M. J. The Mental Capacity of the American Negro, *Archives of Psychology*, No. 28, 1913.

[2] See for example, Mayo, as above.

[3] Strong, A. C., Three Hundred Fifty White and Colored Children Measured by the Binet Simon Measuring Scale of Intelligence, *Ped. Sem.* Vol. 20, 1913, pp. 485-515; Phillips, B. A., The Binet Tests Applied to Colored Children, chiefly Kaffirs, *Tr. Sch. Bull.*, Vol. 12, 1915, pp. 122-3; Redfern, L. H. and Rich, S. G., Binet Tests on South African Natives—Zulus, *Ped. Sem.* Vol. 24, 1917, pp. 373-83; Sunne, Dagny, A Comparative Study of White and Negro Children, *J. of Appl. Psychol.*, Vol. 1, 1917, pp. 71-83.

[4] See especially Pyle, W. H., The Mind of the Negro Child, *School and Society*, Vol. 1, 1915, pp. 357-60; Ferguson, G. C. Jr., The Psychology of the Negro; An Experimental Study, *Archives of Psychology*, No. 36, 1916, pp. 138; and Sunne, Strong, Redfern above; also Woodworth, R. S., Comparative Psychology of Races, *Psychol. Bulletin*, Vol. 13, 1916, pp. 388-96; and Thorndike, E. L., *Educational Psychology*, Vol. III, pp. 206-24, 1914.

[5] Some Suggestions Relative to a Study of the Mental Attitude of the Negro, *Ped. Sem.* Vol. 23, 1916, pp. 199-204.

ation of such data is not easy. The unsatisfactory school work of colored children may be, in part at least, merely an indication of lack of adaptation of the schools to their special needs. It may surely be questioned whether tests given by white examiners to colored pupils can give reliable data for a comparison of the races. There may even be some doubt as to whether, with examiners of their own race, the reaction of the colored children to the test situation would be quite the reaction of white children. In any case, the fact must not be forgotten that the colored children come from a social and psychological environment which is subtly but powerfully different from the environment which molds the mentalities of the white children; standards of living, moral and religious ideas, sentiments and interests and ideals, are all pervasively different. It should be said at once that in the present instance the tests were given by white examiners, to colored children in schools showing no attempt at adaptation to the particular needs of the race, and in communities where there is sufficient race consciousness for the colored people to be a distinct class by themselves. But certain of the differences found seem too marked to be explainable as the result of such factors alone. There is, further, a sufficient variety of material available with regard to the subjects studied to make possible some little analysis of the situation.

The material consists of measurements, with a group scale of intelligence recently developed at Indiana University,[6] from all the children from the third through the twelfth grades in two schools for colored children in two small Indiana cities—a total of 187 cases in all—together with a study of the age-grade placement of these children. The examining was done by the senior writer and his wife. The scale used may be briefly described as consisting of ten tests, each of twenty items, each test being applicable roughly from the third grade through high school or from 8 to 16 years in age. The individual tests will be described briefly, later, in connection with an analysis by test.

The paper will take up in turn the following questions: (1) Grade for grade, how do the colored children compare with the white children? Do the colored schools have their own standards as to the amount of innate ability necessary for work in a given grade? In studying this question the colored schools will be compared with the grade distributions from one of these two cities (City A)—a total of 1,022 cases.

[6] Pressey, S. L. and L. W., A Group Point Scale for Measuring General Intelligence, With First Results from 1,100 School Children, *Jr. of Appl. Psychol.* Vol. II, 1918, pp. 250-269.

(2) Age for age, how do the colored children compare with white children? The scores made by the negro children will be compared with results from a total of 2,800 white children tested in these two cities and one other city (Cities A, B, and C). (3) Do the colored children show a distinctive make-up of abilities? In studying this question the results on the separate tests of the scale will be compared with norms for each test obtained from the white children of City A.

II. *Results.* The composition of the grades in the colored schools may be briefly indicated. The number of children tested in each grade was as follows:

Grade	3	4	5	6	7	8	9	10	11	12	Total
Number	31	36	49	28	14	5	7	4	12	1	187

The figures suggest a banking up of cases in the first three of these grades, and a high retardation. The colored schools showed, in fact, a total retardation 90% greater than the retardation for the white children of City A, and an acceleration less than half as great. The colored children also averaged ten months older per grade. If we turn now to the scores made by these children on the tests, we find that only 36% of the colored children scored at or above the median for their grade in the white schools, 13% scored above the 75 percentile, 51% below the 25 percentile. To put it another way, the colored children of a given grade average about at the average for the grade below theirs in the white schools. Apparently the colored schools require less intelligence, for admission to a given grade, than do the white schools. Grade for grade, the children in the colored schools average ten months older than the white children. Nevertheless, the grade averages are distinctly lower in the colored schools.

But the fact that the colored schools distribute their children differently in the grades, as regards age, makes it impossible to obtain, from the grade averages, any satisfactory evidence as to the amount of difference between colored and white children in mental endowment. For such a purpose children of the same age should be compared. The number of cases tested at each age was as follows:

Age	7	8	9	10	11	12	13	14	15	16	17	Total
Number	1	11	20	24	25	27	23	21	14	12	9	187

After careful study of the age-grade distributions it was decided that the most reliable ages for comparison were ten, eleven, twelve, thirteen, and fourteen. Below ten there were too many cases who were in the first and second grades (and so not tested) to give a fair sampling; after fourteen the duller children drop out of school. Of 120 colored children

within these ages, only 14% score at or above the median for the white children of the corresponding age. Only 3% of the colored children score above the 75 percentiles of the white distribution. But 54% of the colored children score below the white 25 percentile. To put it another way, the colored children average at about the average for white children two years younger.

When compared age for age, the colored children thus make a poorer showing than when compared grade for grade. Apparently the colored schools, having to deal with poorer mental material, have tried to keep up grade standards by retarding their children more—but have only partially succeeded.

The scores of the colored children were next analyzed by test (using again, data from the five ages above mentioned). The per cents scoring at or above the medians for the white children, on each of the ten tests, are as follows:

Test	1	2	3	4	5	6	7	8	9	10
Per cent	33	30	29	15	29	22	14	13	22	16

The colored children do relatively well on the first, second, third, and fifth tests. The first is a test of rote memory; the children are read such lists as "chalk, man, bag, book, sister," and then asked to write the word that came after "chalk." The fifth is a test of logical memory; the children are read a newspaper passage and are then asked questions about it. The second is a test of practical judgment; the test consists of such lists as "CHAIR;—arm, cushion, legs, rockers, seat," and the children are told to "underline, in each list, the two things which the thing named in big letters at the beginning of the list is *never* without." The third is a test of practical arithmetic; the children are read such problems as "If you had 25 cents and bought two erasers at 3 cents each and a bottle of ink at 5 cents, how much would you have left?"

The tests on which the colored children make the poorest showing are four of the five "literary" tests of the scale. Two of them involve controlled association, the fourth (Opposites) and the tenth (Analogies); one of them requires a knowledge of moral terms and one calls for verbal ingenuity (number 8, Disarranged Sentences). The sixth test (Word Completion—the test consists of such words as "a—it—me—ic" and the children are expected to fill in the missing letters) and the ninth test (Practical Information—the test contains such lists as "bill, coin, check, draft, stamps," and the children are asked to "put a line under the safest way to send money,

and a cross after the least safe way") give results, with the colored children, midway between these extremes.[7]

III. *Discussion.* The above results are undoubtedly influenced by some of the prejudicial factors mentioned at the beginning of the paper. The examination was given by white examiners; the tests were framed for use with white children. But certain of these differences between white children, and colored children living in the same community and taught under the same school system, are too marked to be wholly thus explained. A poor average ability seems unmistakably indicated—a poor ability inadequately compensated for in the schools by a greater retardation, and so leading to lower grade standards as well.

It is natural, however, to seek an explanation for the lower scores in some special defect rather than in a general incapacity; each race might be supposed to have both weak and strong points. Analysis by test gives little support for such a theory; the colored children show poorer ability than the whites on every test. But there are distinct differences from test to test; twice as many colored children make scores above the medians for the whites on the first, second, third, and fifth tests as on the fourth, seventh, and eighth. The colored children do best in a test of rote memory. They do poorest in a test of verbal ingenuity and a test involving knowledge of abstract terms. It is easy to generalize, and conclude that colored children do best on tests pertaining to very concrete problems, or making demands upon the more simple mental processes. But such generalizations help us very little in getting at the real facts as to mental differences. It is more pertinent to note, in this connection, that the first test has been found poorest of the ten in differentiation of feebleminded and subnormal cases, the eighth most differential, and that the fifth and first are least differential of superior ability, the seventh and tenth the most differential. There is the definite suggestion here of a more elementary and less highly developed ability among colored children.

But one keeps coming back to the notion that the important racial difference may be, after all, emotional and tempera-

[7] It should also be noted that the per cent passing each test above the white medians shows a fairly regular decline from the first to the last test; that is, there is a suggestion of a fatigue curve. One cannot help but wonder whether there is not evidence here of a greater fatigability on the part of the colored children. Fatigability is surely not the only factor at work; the last tests are also tests of the more complex processes. But this dropping off in scores toward the end of the examination is distinctly interesting.

mental. Possible evidence of a greater fatigability on the part of the colored children has already been mentioned. The present study offers little material relative to such differences. But the writer is convinced that measures of such differences can be obtained. He feels strongly that the possibilities of group "tests" as instruments for research have hardly yet been realized. Group tests for the measurement of persistence, of effort and interest, are, he believes, a likely development of the near future.

IV. *Summary.* Measurements, obtained from the children in two colored schools with a group scale of intelligence, show that:

1. The colored children of a given grade average at about the average for white children one grade below theirs.

2. The colored children of a given age average at about the average for white children (in the same city) two years younger.

3. Analysis by test shows the colored children to average below white children of the same age on all the tests. The colored children rate best on a test of rote memory, poorest on a test involving differentiation of abstract terms and a test of verbal ingenuity. It is suggested that in general colored children may do relatively well in dealing with concrete and routine problems, and poorly where abstraction or mental reconstruction is called for.

4. Study of racial differences by means of group tests of persistence, and of interest, is suggested.

II. A STUDY OF COUNTRY CHILDREN IN (1) A GOOD AND (2) A POOR FARMING DISTRICT BY MEANS OF A GROUP SCALE OF INTELLIGENCE

By S. L. Pressey and J. B. Thomas.

I. *Materials and Problem.* The materials of the study consist of results from 270 country school children tested by one of the writers (Dr. Pressey) and his wife in a poor rural district in southern Indiana, and 268 country school children in a fairly good agricultural district in the central part of the state, examined by a graduate student in Psychology (Mr. Thomas). The first group was examined in the spring of 1918, the second in the fall of that year. The scale employed in the preceding study was used here; and comparisons are with the norms referred to there.

The children examined were almost entirely of American stock. Special difficulties qualifying the findings, such as language handicap, were thus not encountered. It should be said at once, however, that the data from the two country districts includes, besides children in the one room country schools, children in the schools of several small villages, trading centers for the country round about. In the first district there is also a small quarry town of perhaps 200 inhabitants, and in the second district a slightly larger mining town. Both quarry and mine obtain their labor largely from the country near, so the community centering around them can hardly be considered essentially different from the surrounding country. In fact, in this mingling of agriculture and small scale industry, the districts may be said to be distinctly typical of southern Indiana.

In working over the data three questions have been considered. (1) Age for age, how do country children compare with city children? In studying this question the results from the two country districts have been combined and comparison made with results from the 2,800 city children, already mentioned. (2) Do the country children show distinctive results on the separate tests? The comparison here is with norms for each test obtained from City A. (3) Is there any evidence to show that the less intelligent people live in the poorer country district? Comparison has here been made of each

of the two country districts with the norms from three cities previously referred to.

II. *Results.* The total number of country children at each age ran as follows:

Age	8	9	10	11	12	13	14	15	16	Total
No.	17	59	86	81	78	76	49	39	18	503

Because of the factors of grade selection mentioned in the preceding study, it was considered wise to use only ages 10-14 inclusive in these comparisons. It soon appeared, however, that elimination in the country began earlier than in the city. This affected particularly the group examined in March, the older boys having already left school to help in the spring plowing. Only country children from ages 10-13 have therefore been used in the comparisons. The per cents, at each of these ages, testing at or above the median for city children of the same age are as follows:

Age	10	11	12	13
Per cent	29%	33%	21%	25%

Of the total of 321 country children, of these four ages, 27% test above the age medians of the city children; 8% score above the 75 percentile; 42% rate below the 25 percentiles.

Again analysis by test is naturally looked to for aid in understanding these findings. In making this analysis the results from the same four ages have again been lumped, and the per cent of the country children scoring at or above the median for their age, on each test, has been found.

Test	1	2	3	4	5	6	7	8	9	10
Per cent	38	35	39	26	40	29	25	33	33	31

The most important feature seems to be the lack of such marked differences from test to test as were found in the similar analysis of the colored data. The colored children do almost three times as well on the first test as on the eighth. The poorest results shown by the country children are on test 7; the best showing is 40% on test 5.[1] The country children do not thus present a distinctive make-up of examination, but show a slightly poorer ability on all tests.

It is not infrequently asserted that in the country districts a constant selective process is going on, the poorer, less intelligent stock being pushed back more and more into the hill country where the land is poorest, while the more able, assertive elements of the population obtain the best land and the best opportunities. That is, on this assumption, there

[1] For a description of the separate tests see the previous study.

should, in an agricultural community, be a positive correlation between land values and intelligence. The two districts from which the data of the present study were obtained seem not ill suited to test this hypothesis. District 1 is hilly, the soil is poor; markets are hard to get at. The land in District 2 is much better and markets are much nearer. It has been estimated roughly that the land in the second district is worth three times as much as that in the first.

A comparison of the school children in the two districts by means of a mental test is thus distinctly interesting. For the four ages used above, 20% of the children in District 1 rate above the medians for the city children as compared with 36% in District 2—the better district; 6% in the poorer district score above the 75 percentile for the city children, as compared with 11% in the better district; 48% in the poorer district rate below the 25 percentile for the city children, as compared with 28% in the better district.

These figures are probably not as reliable as one would wish. The schools in the poorer district were examined in March, which is close to the end of the year for the six months' schools. Already the children who could be of most assistance in the spring work on the farms had left school, in many instances. Because of this the figures from District 1 are possibly a little too low.[1] As has already been said, the two districts were not examined by the same examiner. The examinations in District 2 were made by the least skilled examiner, and it is not improbable that the children in this district profited by his inexperience and his desire to be wholly fair to his children. But it is hard to entirely explain away the differences between these two districts by such special circumstances. At least, the results are of suggestive value,—are of decided interest in indicating ways in which results from a mental survey may be of use in the study of sociological problems.

III. *Discussion.* A word remains to be said as to possible explanations of the lower scores made by the country children. The obvious conclusion would be that the country children were less intelligent. The writer feels that such an explanation is decidedly not wholly adequate. For one thing, country children do not meet the test situation in the easy matter-of-fact way usual with city children. They are distinctly shy with strangers, especially if they feel that the strangers come from the city; they adapt much less readily to the special

[1] The country teachers usually say, however, that it is the duller children who thus leave school before the end of the term.

procedures and types of problem involved in the usual measurements of intelligence. That is, they show distinctly less "testability," though not necessarily less intelligence in meeting the problems of their own environment.

Further, the tests used were all verbal; they were presented on paper and involved the constant use of a pencil. The children were not as dextrous with their pencils as city children. In many instances, there were only two or three pencils in a school; the written work was on the blackboard or on slates. Awkwardness, some embarrassment, and slow writing were the consequences. Moreover, verbal tests, such as were used, can hardly be expected to give a total measure of ability in a community where the work is almost wholly manual. Performance tests and, perhaps, a different mode of approach would seem necessary. It was urged in the preceding paper that the usual forms of intelligence tests are inadequate for the study of racial differences; it is urged again that these same tests need not a little supplementation in studying groups from very different environments.

IV. *Summary.* 1. A group of unselected country children rate about a year and a half in mental age below city children.

2. Analysis by test shows nothing that could be considered distinctive.

3. The children in a good farming district average above children in a poor farming district.

4. It is urged that the usual type of intelligence tests does not give adequate measures of the ability of country children; performance tests and materials more relevant to their environment are needed.

BOOK REVIEWS

H. Addington Bruce. *Nerve Control and How to Gain It.* Funk & Wagnalls, New York and London, 1918. p. IX and 307.

The purpose of this book, as stated by the author in the preface, is to aid primarily those persons who are suffering from nervous invalidism or feel themselves approaching it. Hope is also expressed that it will prove useful to normal individuals who wish to gain a precise knowledge of the fundamentals of personal hygiene.

With simple non-technical language Dr. Bruce presents in a clear wholesome manner the facts of mental hygiene that have been derived from the many medical, physiological and psychological researches carried on by the leading investigators in all parts of the world. Assuming that nervousness is not a disease in itself but rather a symptom of ill health which may have resulted from any one of many physical or mental causes, he proceeds to discuss these causes one by one in the form of little friendly talks. The topics include the effects of such bad habits as worry, fear, anger, selfishness, trouble seeking, etc., and how to overcome them; the value and proper use of foods, the beneficial effects of the right kind of exercise, the importance of assuming a correct posture, the vital relation of fresh air and sunshine to health, the benefits of rest and relaxation and the necessity of a right outlook, besides many others.

The book closes with a plea for the establishment of free institutions by the state, municipality or philanthropic individuals, for the care of persons suffering from functional nervous disease who have not the financial means to take treatment at private sanitoriums. In the author's words "it is a disgrace, it is socially criminal to leave the nervous poor to shift for themselves."

This contribution comes from one who, from long training and experience in the field of mental hygiene, is able to speak with authority and it can, without question, be recommended as a sound and practical guide to the art of right living and thinking.

I. A. Field.

Roy Franklin Richardson. *The Psychology and Pedagogy of Anger.* Warwick & York, Baltimore, 1918. p. 100.

In this little book, Professor Richardson has summarized the results obtained from a dozen Clark University students, trained in introspection, who attempted to make full observations of their emotions for a period of three months. Their reports are classified under the following chapter headings: Mental Situations Stimulating Anger; Behavior of Consciousness; Disappearance of Anger; Conscious After-effects; Educational Function.

Prof. Richardson's subjects find that while the psychic background of anger may be a general irritation tending to focus on some particular person or object, or the inducement of negative self-feeling for which the anger compensates, the balance of evidence goes to prove that Wundt's conscious fore-period is ordinarily absent, the emotion

of anger seizing the person suddenly without any awareness of its genesis. The conscious response to the emotion may be one of three types:

1. "Attributive reactions," in which the angry person indulges in all types of mental imagery whereby he expresses his feelings (in imagination only), or builds plans for future revenge, etc.

2. "Contrary reactions," in which religious and moral beliefs control his conduct so that he restrains his wrath and "loves his enemy."

3. "Indifferent reactions," in which the helpfulness of the angry person leads him to make the best of the situation and assume a philosophical attitude of indifference.

By far the largest percentage of anger reactions fall under the first class. The second class conforms so closely to the psycho-analytic mechanisms of repression and defense that it is a pity the author did not take time to point out the analogy and give us his opinion concerning the application of the Freudian principles developed in connection with the sexual emotion to other instincts and emotions.

An affective attitude of pleasantness or unpleasantness may be concomitant with anger, accordingly as it does or does not find adequate relief in expression. Only in cases where it is fully and completely vented upon its object or in some substitutive activity does anger finally disappear. Controlled anger tends to return to consciousness repeatedly. Here again it is to be suggested that the introspective results confirm expectations which would be created by an application of the psycho-analytic rubrics.

The after-effects of anger are varied,—pity, shame, anxiety, contrition, pleasure, increased friendliness, relief, curiosity, fear, etc., are listed, and seem to depend on the complex of factors which go to make up the stimulus situation and the type of subjective reaction. This ambi-valent swing into another emotion has been explained by Cannon and other investigators on a physiological basis, and the chapter would be more comprehensive had Prof. Richardson chosen to supplement his introspective material with a reference to these findings.

The chapter on educational functions is rich in pedagogical suggestions. It is impossible to over-emphasize the motivating power of held-over anger attitudes in human conduct, and the teacher who knows how to arouse and guide anger aright is indeed wise. Each individual pupil must be studied, for where anger may prove an incentive to greater effort in one, it may be the source of discontent and a surly, mischievous attitude in another. If it can be roused against the proper obstacles, and sublimated into arduous labor, it becomes a vital factor in education.

PHYLLIS BLANCHARD.

NOTES.

September 1st, 1917, the Community Service Society, Youngstown, Ohio, organized and opened The Children's Service Bureau as one of its departments with a separate staff and board of directors. The plan and work of the Bureau was outlined and promoted and is now being directed by Mr. J. M. Hanson, Secretary of the Community Service Society. It has been privately supported by Mr. H. H. Stambaugh, who has just died, and who while living, quietly but generously and effectively used his personal influence and finances in developing constructive social programs.

The Bureau was established to be the general clearing house for work in behalf of children in Mahoning County. It was founded on the belief that by early study of the "problem children" in the schools and by intelligent action in meeting their individual needs, most of them can be saved to themselves and to society. This, therefore is what the Bureau has undertaken to prove to the community. It has worked in close co-operation with, and has supplemented, the Public Schools and the Court of Domestic Relations, and intends to continue doing so until provision is made from tax funds for a scientifically directed educational program. One school of nearly 1,000 pupils representing 20 nationalities, was chosen as a demonstration center. Here every child entering the lower grades is studied to determine his physical condition, his mental abilities and defects, and the environmental influences. These studies are now in progress and when completed will serve as a basis for recommending to the school such medical and social corrective measures, such re-classification of children and such an altered educational procedure as this investigation indicates and warrants. Careful follow-up work in the homes is done by the school nurse and school extension worker.

The Paidological department, under the direction of Dr. H. H. Young, has been making intensive studies of children referred to it by parents, the public schools, the Court of Domestic Relations, the Children's Home, Civilian Relief of Red Cross and the various charitable and social agencies of the city. Dr. Young has been officially appointed by the Board of Education as their examining psychologist and, although not officially appointed, has also been doing the psychological work for the Court of Domestic Relations.

The Bureau, because privately supported, is able to serve these two important public institutions and to help work out a few of the many problem cases they have in common. As a result of this correlation the rapidly accumulating evidence shows how the work of the Juvenile Court and of the schools is one and the same, and that there is no such a real differentiation in function as the existence of these as two separate institutions indicates and emphasizes. Time and again, the child referred by the schools is found to have a court record, and the one referred by the court is found to be the source of much annoyance and a problem in the schools. With such cases, the best social adjustment can be made if the child's past record and present condition be investigated, evaluated and interpreted by some one agency which serves as a clearing house in co-ordinating the various isolated attempts of independent agencies.

When in 1916 the Institute for Public Service began issuing from New York City its weekly post card bulletin *Public Service* and other educational reviews it was stated that its financial backer could not be named. For the first time the chief donor's name is now published,—Julius H. Barnes now U. S. Wheat Director and since 1917 president of the U. S. Grain Corporation which stabilized wheat prices during the war.

Mr. Barnes' interest in "learning by doing" made him consider starting a boys' school. He finally decided to promote "learning by doing" everywhere instead of in one spot and started the Institute for Public Service to try out circulating facts about best practices in school work. The offices are at 51 Chambers street, New York city from which center it has conducted field surveys, clipped educational and lay journals for best practices; compiled and distributed such pamphlets as High Spots in New York Schools, Rainbow Promises of Progress in Education, War Fact Tests for Every American, Teacher Personality Charts, Graduates Who Win and many others; answered questions from teachers and superintendents.

Mr. Barnes himself as U. S. Wheat Director will value the co-operation of the nation's teachers in securing the further patriotic help of children and their parents in circulating and using the truth about our bread supply. His offices are at 42 Broadway, New York city from which inquiries will be promptly answered.

It was Mr. Barnes' suggestion, too, that during this next year the Institute issue from time to time teachable facts about bolshevism. Several bulletins were issued last year and a great many letters answered. For copy of these bulletins and further information address William H. Allen, director, 51 Chambers street, New York city.

Dr. W. W. Charters, Dean of the School of Education of the University of Illinois, will on September first become Professor of Education and Director of the Research Bureau for Retail Training at the Carnegie Institute of Technology. He will also serve as consultant on curriculum problems arising within the various technical and vocational divisions of the Institute. Dr. J. B. Miner, who has been Acting Director of this Research Bureau, will continue with the Bureau and will also teach some advanced courses in vocational psychology.

Dr. Kate Gordon has been promoted to an Associate Professorship in the Division of Applied Psychology at the Carnegie Institute of Technology, and has been given leave of absence for a portion of next year to continue the investigations for the California State Board of Charities begun during the first semester of last year.

Major C. S. Yoakum, Associate Professor of Applied Psychology at the Carnegie Institute of Technology, has become Director of the Bureau of Personnel Research, formerly called the Bureau of Salesmanship Research. Colonel Walter Dill Scott continues as Associate Director of this Bureau, part-time, but he will be resident in Evanston during the greater portion of the year.

Dr. Harry D. Kitson, Instructor in Psychology at The University of Chicago, has accepted the position at Indiana University, made vacant by Professor E. C. Lindley who accepted the presidency of the University of Idaho.

Directory of American Psychological Periodicals

American Journal of Psychology—Worcester, Mass.: Florence Chandler.
Subscription $5. 600 pages annually. Edited by G. Stanley Hall.
Quarterly. General and experimental psychology. Founded 1887.

Pedagogical Seminary—Worcester, Mass.: Florence Chandler.
Subscription $5. 575 pages annually. Edited by G. Stanley Hall.
Quarterly. Pedagogy and educational psychology. Founded 1891.

Psychological Review—Princeton, N. J.: Psychological Review Company.
Subscription (with Psychological Bulletin) $6. 480 pages annually.
Bi-monthly. General. Founded 1894. Edited by Howard C. Warren.

Psychological Bulletin—Princeton, N. J.: Psychological Review Company.
Subscription $3.25. 480 pages annually. Psychological literature.
Monthly. Founded 1904. Edited by Shepherd I. Franz.

Psychological Monographs—Princeton, N. J.: Psychological Review Company.
Subscription $4. per vol. 500 pages. Founded 1895. Edited by James R. Angell.
Published without fixed dates, each issue one or more researches.

Psychological Index—Princeton, N. J.: Psychological Review Company.
Subscription $1.25 200 pages. Founded 1895. Edited by Madison Bentley.
An annual bibliography of psychological literature.

Journal of Philosophy, Psychology and Scientific Methods—New York:
Sub-Station 84. Bi-weekly. 728 pages per volume. Founded 1904.
Subscription $3. Edited by F. J. E. Woodbridge and Wendell T. Bush.

Archives of Psychology—Sub-Station 84, New York: Archives of Psychology.
Subscription $5. 600 pp. annually. Founded 1906. Edited by R. S. Woodworth.
Published without fixed dates, each number a single experimental study.

Journal of Abnormal Psychology—Boston: Richard G. Badger. Subscription $5. 480 pages annually. Ed. by Morton Prince. Bi-monthly. Founded 1906.
Entire field of abnormal psychology.

Psychological Clinic—Philadelphia: Psychological Clinic Press.
Subscription $1.50. 280 pages annually. Edited by Lightner Witmer.
Monthly (9 numbers). Orthogenics, psychology, hygiene. Founded 1907.

Training School Bulletin—Vineland, N. J.: The Training School.
Subscription $1. 160 pages annually. Ed. by E. R. Johnstone. Founded 1904.
Monthly (10 numbers). Psychology and training of defectives.

Journal of Race Development—Worcester, Mass.: Louis N. Wilson.
Subscription $3. 460 pages annually. Founded 1910. Quarterly.
Edited by George H. Blakeslee and G. Stanley Hall.

Journal of Educational Psychology—Baltimore: Warwick & York.
Subscription $3. 600 pages annually. Founded 1910.
Monthly (10 numbers). Managing Editor, J. Carleton Bell.
(Educational Psychology Monographs. Edited by Guy M. Whipple.
Published separately at varying prices. Same publishers.)

Journal of Animal Behavior—Cambridge, Mass.: Emerson Hall.
Subscription $5. 450 pages annually. Founded 1911.
Bi-monthly. Robert M. Yerkes, Managing Editor.

The Behavior Monographs—Cambridge, Mass.: Emerson Hall.
Subscription $5. 450 pages per volume. Edited by John B. Watson.
Published without fixed dates, each number a single research.

Psychoanalytic Review—Washington, D. C.: 3617 Tenth St., N. W.
Subscription $5. 500 pages annually. Psychoanalysis.
Quarterly. Founded 1913. Ed. by W. A. White and S. E. Jelliffe.

Journal of Experimental Psychology—Princeton, N. J.: Psychological Review Company. 480 pages annually. Experimental. Founded 1916.
Subscription $3.25 Bi-monthly. Edited by John B. Watson.

Journal of Applied Psychology—Worcester, Mass.: Florence Chandler.
Subscription $4. 400 pages annually. Quarterly. Founded 1917.
Edited by G. Stanley Hall and L. R. Geissler.

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